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PRESIDENT'S ADDRESS*

AMERICAN ASSOCIATION OF ORTHODONTISTS

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IN THE course of the ages, man has labored unremittingly to improve his position in the struggle for existence. In the beginning, he was influenced by purely selfish impulses, but as his development advanced to include others than those immediately necessary to his comfort, a cooperative spirit was developed which bound tribes and states and nations together. When we follow this evolutionary process farther along to the time when altruism and ethics had become strong motivating forces, we may visualize, at least in part, the "cradle" of our professions. In no other field has man's moral and intellectual development been more manifest than in those groups who, down through the centuries, have devoted their energies to the healing art. To read the history of this advancing growth from its inception to the present time, one finds a sequence of facts and achievements which match the wildest hopes of alchemists of past ages whose dreams were deemed fantastic.

That orthodontics should come into being and reach its present possibilities for helpfulness seems but natural when we view the panorama of medical progress as a whole, but, like medicine, its greatest advancement has come during the life span of some who are here. It has, in fact, been the rare privilege of this organization, during the past thirty-seven years, to contribute in a very large way in making orthodontics a well-established and fully justified branch of the healing art. This fact should not cause us to become self-complacent or satisfied with our present situation, but should rather constitute a stimulus to make us carry on, to the end that our specialty shall year by

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year measure a creditable and needed advancement. It is to this high purpose that each meeting of our Association is dedicated, and we are hopeful that every member stands pledged to this objective.

In making preparation for the 1938 meeting, your officers have endeavored to so fashion the program, and our Convention as a whole, that all in attendance will return to their offices better prepared to meet the tasks and obligations of practice. To this end, it has been directed to the things we must work with and think about and strive for in meeting the problems of orthodontics, both as individuals and as an organized specialty. This statement gives recognition to the fact that we have more to consider than clinical efficiency. Regardless of how successful a member may be, his obligations extend beyond his own office and his own patients if he is possessed of the true professional spirit. Hence all things essential to the progress and solidarity of orthodontics become the personal obligation and interest of each member of this Association. This is true whether it be the type of education best suited to produce orthodontists of the future, the legislation essential to protect their interests and that of the public, socio-economic conditions affecting all orthodontists and professional standards in general, or the education of the public and of the medical and dental professions in matters orthodontic. All of these factors enter into the objective which brings us together on the occasion of our annual meetings.

From time to time there is evidenced in certain quarters here and in other lands where our specialty is practiced, a pessimistic attitude toward the possibilities of orthodontic treatment. In reading these expressions of opinion, a timid person or one who is easily convinced might be led to the conclusion that the correction of dental and oral anomalies is surrounded with so much uncertainty that such efforts, more often than not, are futile. From similar sources the opinion is also expressed that so little is known about the basic causes of dental anomalies that it is a case of "groping in the dark," while others exhibit a state of confusion which renders their opinions unstable and incapable of reaching finality. That the known facts of orthodontics will controvert these opinions has been evident to clinicians properly grounded in essential knowledge, and possessed of the energy and industry necessary to carry cases through in an efficient way. This "efficiency" includes more than mere routine treatment, for with it must go the tact and persistence which compel patients to assume their full responsibility and make their own contributions to successful treatment. This does not mean that all dental and oral anomalies are susceptible to correction, for under certain pathological conditions we encounter incurable cases, but fortunately these constitute a relatively small percentage which the skillful diagnostician recognizes and does not undertake. The fact remains, however, that through the use of the known and well-established principles of orthodontic practice, grievous deformities may be relieved and the lives of children made brighter, happier, and more healthful. Therefore, upon the basis of real facts, the pessimistic attitude is not justified and should be discouraged, with the emphasis put upon the capacity or noncapacity of the orthodontist.

This brings to the fore the question of orthodontic consultation, whether it be between the patient and the orthodontist, or in those all too rare instances where two or more practitioners collaborate their efforts upon the same case. If this latter situation could prevail more frequently, it would doubtless prove helpful in many of those instances where the question of treatment or non-treatment of some unusual anomaly is under consideration, and might do its part in making the parents of our patients realize that in orthodontics, consultation is as much a professional service as in the other branches of medical practice. As long as this period remains predominantly a "sales talk activity," our specialty will continue to suffer a belittlement which it does not deserve. When orthodontists, in large numbers, have the moral courage to place this initial contact upon a professional basis, with a fee charged for it in those instances where charity is not deserved, the "shopper" will be eliminated, and public respect altered and increased. This may be augmented if, in the treatment of all cases, industry and thoroughness and persistence are made to replace that type of effort which all too frequently is concerned largely with "wishful thinking" and "watchful waiting." A casual or "lazy" attitude toward treatment, either by the patient or the orthodontist, is the surest way to court disaster. Such practice should be condemned by members of this Association.

At the last meeting of this society, a new Constitution and By-Laws was adopted, and a carefully considered reorganization plan was inaugurated. Your officers and some of the committees have, therefore, carried an additional burden throughout the past year in putting into effect the new order which the edict of the members rendered mandatory. A splendid degree of cooperation has been manifest by all the organized sectional orthodontic societies of the nation, each of which has ratified the reorganization plan, and so altered or adapted their own By-Laws that they are now in harmony with our national body. The former sectional societies have retained their original names and the states they have always served, and in addition to these, a new Constituent Society came into being, known as the Central Society of Orthodontists, whose jurisdiction covers the states of Illinois, Missouri, Iowa, Nebraska, Minnesota, and Wisconsin. In this manner we find orthodontists over the nation organized in a unified body and yet retaining their sectional societies. We find standards of admission to all orthodontic societies brought to the same level; we find the matter of duplication of dues reduced materially; and with it all, each of our members receives our Journal without additional cost. That all of these factors have contributed, and will further contribute to the unification of orthodontic purposes and ideals, is already being made apparent. Tangible evidence to this effect was demonstrated in the case of the payment of dues during the past year when every member of our Association had fulfilled his financial obligations many weeks prior to this meeting, a record never before achieved. While much credit is due to our efficient secretary for this accomplishment, it also demonstrates a fine cooperative spirit among our members.

During the past year other constructive changes have taken place, not the least of which was concerned with our Journal. Through the splendid

cooperation of its publishers, The C. V. Mosby Company, of St. Louis, after twenty-two years of publication, its name was changed to THE AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY. This came as a ready response to the request of your officers and the Publication Committee who felt that the new title was far more appropriate for the official journal of the world's outstanding orthodontic society. At the suggestion of the officers of the American Association of Orthodontists, the publishers have removed all advertising material from the title page, so that today it stands as one of the most attractive and best edited professional journals published. That within its pages may be seen our own proceedings and, in addition, an accurate cross-sectional view of orthodontic thought, representing all shades of opinion, accompanied always by a generous number of beautifully made illustrations, is apparent to all. Another innovation, characteristic of the generous attitude of our publishers, and in keeping with the cooperative spirit always given us, is a new annual contract between our Publication Committee and The C. V. Mosby Company. Through this contract the American Association of Orthodontists is given control of the Journal through its Editorial Board, the majority of which must be past presidents of this organization. In the event of vacancies occurring upon this Board, new members are selected alternately by this Association and The C. V. Mosby Company from among our past presidents. These two groups (i.e., those representing the Association and the publishers) choose an additional member of the board. In the event a new editor is to be chosen, his appointment is made jointly by this Board and by the publishers. A blanket subscription contract of advantage, in addition to the above, is also provided. Such an arrangement is most advantageous to our group, for it enables us to look forward to complete journalistic service, without financial responsibilities which could easily prove disastrous.

Other ad interim activities, in addition to reorganization and our official Journal, have engaged the thought and effort of your officers and committees. Among these the Socio-Economic and Public Relations Committees have had a busy year. Their reports in detail will be brought before our Association at the proper time, and like most of the other material presented at our Executive Sessions, deserve your earnest attention. All too frequently these sessions are shunned by many of our members, but this year a special effort has been made to so arrange our program that the work of these committees, so vital to our society's progress, may be fully heard. This seems important, not only from the standpoint of gaining a fuller cooperation, but also to dissipate the idea that things are done, and actions taken, without the full consent of those who shoulder the final responsibility. It is with this thought in mind that every member is requested to attend all such sessions. The rank and file of orthodontists have little idea of all the hard work which has gone into opposing and frequently nullifying subversive movements on the part of individuals, publishers, laboratories, and other commercially minded bodies whose efforts, if unchecked, not only belittle orthodontics, but place it in a false light. The details of such efforts and accomplishments are to be made available to you at the proper time.

The necessity for constructive educational effort among those groups related to orthodontics, such as the dental profession, the groups in medicine devoting their efforts to pediatrics, the field of the ear, nose and throat, orthopedics, and child welfare in general, is most essential. Such a movement on our part not only becomes a moral obligation, if we wish to do our part in protecting the health and welfare of the public, but it is becoming increasingly apparent that this will be essential if we are to sustain our rightful position in the professional field. The great misconception of the orthodontic problem, so widely spread, may only be corrected through some united effort in which each member of this Association must play a part. This will call not only for personal effort, but also for financial aid through a period of years. Such a public relations plan, at least in tentative form, should receive your earnest consideration at this meeting. It will be presented to you in detail at one of our Executive Sessions.

Other committee efforts likewise become matters of vital interest, for they concern not only our present but our future. They have been deemed of sufficient importance so that in some instances they have been included in the form of essays in our program. Among such, the question of nomenclature and education will be discussed. When we consider the widely divergent and sometimes meaningless terms which are supposed to describe dental and oral anomalies, we are faced with the fact that in no other field of medicine or dentistry does such confusion reign. It would be unreasonable to expect this situation to be fully clarified at this meeting, but at least we can make a start which, within the next year or two, may lead to something definite. An adequate and logical nomenclature is one of the primary needs of our specialty.

The future of orthodontics will depend upon many things, one of the most important of which will be the character of those who enter it. The question of what requirements they shall be called upon to meet, and who shall train them, seems now to be taking form, with at least the last of these two requisites answered by our universities. That preparation for our field is to be found in graduate courses of study, based upon a background of suitable collegiate training, seems the accepted dictum of the day. Privately conducted courses, or so-called orthodontic schools, have doubtless served an important function in the pioneering stage of our profession, but that day is now past. This seems to be the consensus of orthodontists in general, unless they have a personal interest in some plan which brings them monetary gain.

In considering the prevalent need for orthodontic care, and the thousands of children who never have its benefits, some are prone to feel that orthodontists in large numbers should be created. It seems to many of us who have given the matter careful thought, that a far more important consideration than merely increasing our ranks, is the making of better orthodontists rather than placing the emphasis upon the matter of volume. This responsibility must rest largely upon our universities whose primary concern should be the selection of qualified students and their preparation to meet modern needs. Mass education during the past forty years has in most fields increased the number of graduates of institutions of higher learning at a ratio eight times as rapidly

as the population. This unbalanced picture as we see it today is forcing the conclusion that in the future this wholesale turning out of graduates of various sorts must be replaced by a selective process, based upon character, personality, aptitude, and other qualities, in addition to those usually regarded as educational. We shall hope that this policy will be adopted by our dental schools in the preparation of the orthodontists of the future.

In our effort to uphold orthodontic standards, members of this group are frequently faced with instances where patients have been imposed upon by incompetent practitioners. Disciplinary measures should be meted out to these pseudo-orthodontists who, in some instances, are guilty of malpractice in such a degree that their licenses should be revoked. We, on the other hand, are placed in a peculiar position, for if we appear as witnesses against such individuals, the very testimony we give, in an effort to protect the public, may be warped and misconstrued in the hands of some unscrupulous lawyer, and later used against us in suits which may be more accurately described as "legalized blackmail," than by any other term. Most state laws require that a dentist "utilize ordinary care and skill," which has been defined as "that degree of care and skill customarily used between ordinarily careful members of his profession." He is obliged to keep abreast of the times and is not excused if he departs from approved methods in current use. Liability is judged by the status of knowledge and skill current in the profession at the time treatment is rendered. It would seem that some plan could be devised where the testimony of members of this group could be obtained and utilized in a manner to protect the public against abuses, and establish a true definition of standard methods of practice. The study of this problem is recommended to our Judicial Council, and such other committees whose functions may touch upon it.

During the past year the "Grim Reaper" has passed among us and taken a heavy toll from our ranks, for ten members have answered his summons. We shall miss their genial companionship at this and future meetings, and shall be conscious of the loss of power and interest which they contributed. The report of the Necrology Committee will fully reveal the exact nature of our losses. Among those to be taken was Dr. Frank A. Delabarre of Boston, then President Elect of this Association. The tragedy of his passing was heightened by the fact that we all felt he richly deserved the honor of being President, his many years of interest and service, as well as his personal character, having fitted him so admirably for this distinction.

The loss of a President-Elect by death is an unparalleled incident in the history of our Association, and placed upon your officers an added responsibility. Our By-Laws require such vacancies to be filled by the Ad Interim Committee so that the orderly process of officials or committeemen may go on without interruption. A diligent canvass was made, and after careful deliberation, Dr. Harry Allshouse, Jr., of Kansas City, was unanimously selected. This action was taken not only as a tribute to his personal qualifications, but also to the fact that he was just completing his third year upon our Board of Censors and was thoroughly familiar with the technique of our

organization. We consider this highly important because while much progress has been made in our reorganization plan, a great deal of supplemental work still remains to be carried out during the coming year, so it is especially important that one thoroughly familiar with such things should carry on. From the many expressions of commendation of our members since this action was taken, we are gratified at the wholehearted approval of our action.

There is one growing problem in connection with our annual meetings which promises to get out of bounds, and one which a President brings up with reluctancy. This is concerned with the Ladies' Entertainment feature of our conventions. In view of the fact that the majority of those attending this convention are combining a vacation with it, and naturally are bringing their wives and other members of their families here, the opportunity is offered to me to discuss this matter without offense. To put things frankly and briefly, we may say that at the average convention less than twenty-five per cent of the members bring their wives, and yet the cost of the entertainment of this minority group runs far in excess of the expense connected with the scientific program. Obviously this is an unbalanced and unjust situation. If, in the future, we go into any efficient public relations plan, or undertake some pressing research problem, it is going to cost several thousand dollars a year and we will be forced to curtail expenses along other lines, for the money will not be available from dues, from the commercial exhibits, or from other sources. It is my recommendation, therefore, that in the future the question of Ladies' Entertainment be considered separately from our other convention expenses and that its cost be allocated to those who participate in it. This can be easily computed in advance, and when a member brings his wife the Entertainment Program will include a ticket at "so much per head." In the recent past we have faced a similar situation in the "golf group" of our society, and they have solved it in their characteristic good sportsmanship manner by "paying their own way."

The Socio-Economic Committee has many problems to face and, as a result, must limit itself to those activities which seem most vital during each year. Some of us have felt that if this committee could be enlarged so that a subcommittee could be formed, whose specific efforts would be directed to office economics and the problems of practice, a fruitful avenue of help could be open to our members. We must all make a living, and with proper leadership younger orthodontists could be helped in directing their time and energy along more profitable lines and, at the same time, the interests of older practitioners could be protected from, what in some instances amounts to, ruinous competition through the disruption of well-earned standards. This committee could consider all questions related to conducting an orthodontic practice in a manner to be mutually advantageous to the patient and the orthodontist. This should include equitable fee schedules for the treatment of cases, with a thorough analysis of the plans now in use; charges for consultation, or observation of patients through protracted periods; the arrangement of office hours, to meet the hardship imposed by school attendance; methods of gaining the cooperation of patients in the matter of keeping appointments; the question

of office organization and the various means of making it efficient, and yet keeping general overhead within reasonable bounds. These are but a few of the questions which every practitioner must face, and yet any questionnaire covering this subject reveals a wide latitude of conduct. There must be a common ground within known variants where sound and well-proved business methods will be helpful, both to the patient and the practitioner. Such a study is recommended by your President.

For some time there has been a growing need in our specialty for basic instruction in certain relationships dealing with professional amenities, and also having a bearing upon certain obligations falling within the category of interprofessional relationships. Such instruction from the proper source would prove helpful to all younger members, and would stimulate some older practitioners to a stricter observance of customs which go far toward building the morale of a profession. We are now a large and complex body, and, therefore, a unity of action along many avenues of common interest is imperative. Our By-Laws provide a judicial council of three members within whose jurisdiction such things fall. Among other matters, should we ask them to investigate reports that we have members who name fees over the telephone without having seen the patients involved; who make "follow-up" telephone calls after patients have been in for consultation, thereby injecting into our profession a belittling form of salesmanship; who quote to patients the supposed fees of other men, thereby practicing the technique and manners of the gossip; who examine the mouths and appliances of other men's patients without request, and make comments upon what they see? We know that frequently orthodontists on vacation call upon fellow practitioners without notice, thereby disrupting routine office appointments and nullifying what might otherwise be a helpful and most desirable association. We know that all too often where patients change location, no letters of introduction or explanation are sent, nor is it possible to get information out of the practitioner written to, except after long delays. Not infrequently we read "newspaper booster" articles in which the supposed abilities of some orthodontist are called to public attention on the occasion of a trip east, or west, or to this place or that, the motive given being "special study in orthodontics." Or this same type of practitioner may mail notices to the dental profession or to his patients announcing his traveling intentions for postgraduate study, all of which by its crudeness tends to belittle our specialty in the eyes of the well informed. We know such things exist, and while we may feel in some instances they are errors of the head and not of the heart, does it not lie within our power to correct them? They are inexcusable at this stage of our professional development, and an aggressive campaign of correction is recommended.

One of the important educational features within our own own ranks is to be found in that body sponsored by our society, and known as the American Board of Orthodontics. Fashioned as it was after such medical standardizing bodies as the American Board of Otolaryngology, and the American Academy of Ophthalmology, it has, in a period of less than ten years, made a

real contribution in building orthodontic standards. That it has met with the approval of our members is evidenced by the large number of men who have fulfilled the requirements for certification by the Board. The additional effort required to do this, the preparation of case reports, and the otherwise studious activities essential, have proved stimulating to those who have gone through the process, and have necessitated such men indulging in a self-appraisal which cannot fail to be helpful. This has also added to the value of our orthodontic literature, and increased many men's ability to write and present material of merit. This body deserves the continued support of the Association.

Before bringing these remarks to a close, I want to express my deep appreciation to the officers, committeemen, the essayists, and clinicians, who have labored so faithfully during my administration and in preparation for this meeting. It may truthfully be said that in no instance was there anything but wholehearted response to my requests; this has made my tenure of office an experience which shall ever be filled with happy memories.

We all know that orthodontic progress comes slowly and requires unified effort. The problems of our specialty are many and so varied that the talents of numerous minds must be utilized if they are ever brought to the point approaching finality. In this effort each of us must play a part. When reduced to a formula of simple terms and fundamental accuracy, our Association owes its life and continued power to one basic principle which may be summed up in the word "cooperation." Such service, when not rendered grudgingly or of necessity, lifts men above the commonplace to new heights of character and accomplishment. We have had many illuminating instances of this spirit among our members. Its contagion is manifest in our programs and other activities. This must, and will, go on in a tempo of such power that any discordant voice of petty or selfish interest will be lost in a true symphony of unity. By such efforts we shall blaze a true pathway of progress, and prove the logic of the age-old Hindu proverb, "Help thou thy brother's boat across, and lo, thine own has reached the other shore."

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RELATIONSHIP OF ORTHODONTICS TO ORAL PATHOLOGY

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THE orthodontist has the distinction of being able to observe many important disturbances of the teeth, jaws, and related structures over a wide range of special circumstances. His concern with functional, structural, and spacial relationships on the basis of anatomy, physiology, and mechanics gives him the opportunity to evaluate derangements by well-defined criteria. The diagnosis of disorders coming under such categories has the advantage that it can establish the immediate nature of the problem on its own nosologic terms.

The desiderated correction is usually unequivocal. Although questions of technique are often controversial, they ordinarily attempt to conform to principles employing anatomic, physiologic, and physical methods in the approach to a biologic problem when they are sound. Here again a positive advantage obtains.

These determinants would appear to indicate satisfactorily what course treatment should follow. Underlying them, however, are more fundamental concepts of etiology and pathology.

Derangements owing to miscellaneous kinesiologic or dynamic factors and gross structural deformities with consequent disturbance in the balance among the forces governing the harmonious equilibrium, growth, and development of the integrated dental apparatus may be associated with changes in the arches and their occlusion. The teeth and their supports may maintain relative, if not absolute, structural integrity under such circumstances before secondary changes become superimposed. Thus a real orthodontic problem may be presented in which function, its lack or its disorder, has modified form and relationship without producing tissue lesions of any notable pathologic significance until those associated with subsequent complications become established. In a similar manner, deformity may have appreciable effect in perverting function and establishing a series of concomitant disturbances. These may exaggerate and extend the original lesion and, acting with sufficient force and duration, produce others in the interrelated system.

Considerations of this type are part of the question of diagnosis and must receive precise observation and analysis. They have not usually lent themselves to clinical pathologic discussion, however, although their importance is fundamental. Such morphologic variations have been of interest to the anatomist and the histologist concerned with research in orthodontics and dentistry and to the clinician who would inform himself fully as to the rationale of his procedure. They have not been given sufficient attention except in a somewhat restricted manner.

Read before the annual meeting of the New York Society of Orthodontists, New York, N. Y., March 7, 1938.

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With respect to oral pathology, it is also evident that the greatest variety of lesions may cause a particular orthodontic derangement which is, in the final analysis, only the expression of their presence. Even though they may be comparable, producing the same gross and essentially related histologic effects, they may originate from completely dissimilar causes.

It therefore becomes the responsibility of the dentist confronted with an orthodontic problem to recognize its broadest implications if his procedure is to be valid. Prognosis and end result are also determined by these factors. The combined efforts of orthodontist, oral surgeon, pathologist, and internist may be necessary to effect the solution.

CONGENITAL ANOMALIES

Numerous malformations of the skull of interest to the anthropometrist and the teratologist are of relative unimportance to the orthodontist because they

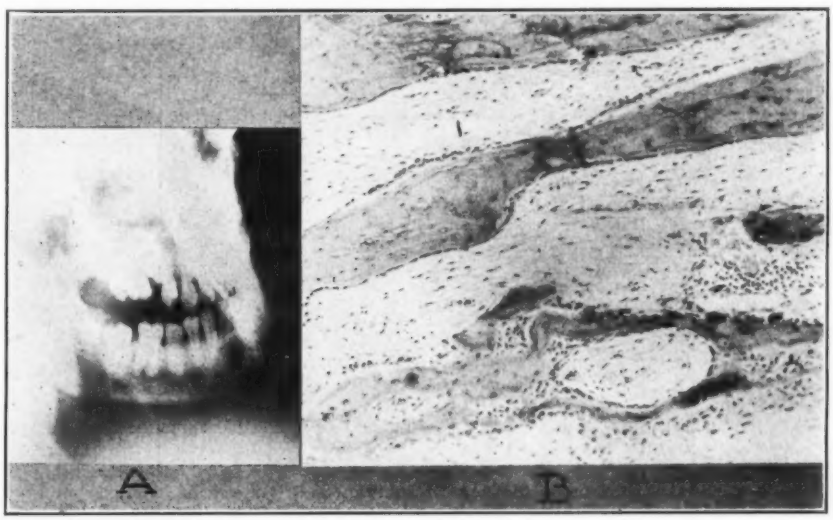


Fig. 1.—Osteogenesis imperfecta: *A*, delicate bone trabeculation, disturbed eruption, and malocclusion; *B*, attenuated bone trabeculae and delicate fibrillar connective tissue marrow with exaggeration of cancellous architecture.*

represent extreme degrees of change often of bizarre nature and not amenable to treatment. When the subjects are viable, the high incidence of mental defect is also deterrent. Yet there are several examples of structural, dysplastic, and aplastic anomalies that are revealing of other changes seen under different circumstances and illustrative of comparable, if unrelated, lesions and mechanisms.

Osteogenesis imperfecta represents a qualitative and quantitative disturbance of the mesenchyme manifesting itself most notably in the skeletal system. Brittleness and pliability of bone with fracture and deformity dominate the clinical aspects of the disease. Failure of the stem cell is associated with poor definition of the cortex, irregularity of cement lines, formation of delicate and attenuated trabeculae with consequent derangement of the Haversian and exaggeration of cancellous architecture (Fig. 1*B*).[5, 29] The cranial ossification may be extremely disorganized, with marked distortion of the shape of the head.

*The author wishes to acknowledge with gratitude the opportunity of having been able to study and photograph several slides kindly placed at his disposal by Dr. Sheldon A. Jacobson.

Teeth are affected in their mesodermal derivatives with hypoplastic and dysplastic effects on the dentine and the pulp.[48] Early loss of teeth, fracture, caries, atrophy of alveolar processes and the palate, and disturbances in deciduous and permanent dentition are observed (Fig. 1*A*).[5, 29]

Osteopetrosis represents the antithesis of osteogenesis imperfecta even though fracture is also common as a result of osseous inadequacy. Increased thickness and density of cortical and cancellous bone are of extreme degree. Even though the skeletal proportion is fairly well retained, the normal ratio of compact and medullary types is almost completely in abeyance. Irregularity of architecture also occurs, although this is of less prominence (Fig. 2). It is attributed to exacerbations and remissions of the osteoblastic activity. Hydrocephalus may be an additional complication to distort the cranium. Although the tooth buds have been described as being of normal appearance and position, dentition occurs late. Caries and osteomyelitis of the jaw are common.[38] The

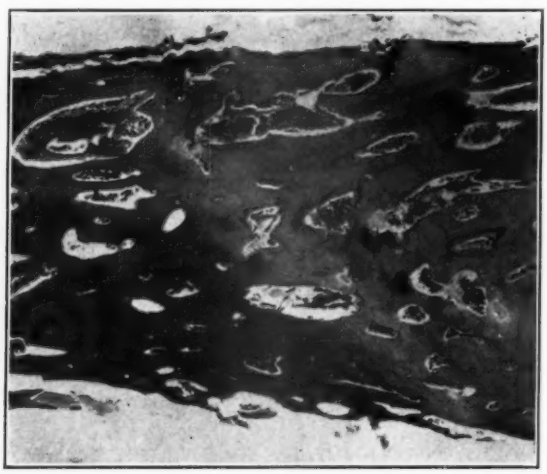


Fig. 2.—Osteopetrosis (marble bone disease). Increased thickness of cortical and cancellous bone with relative and absolute diminution of marrow spaces and marrow.

latter condition may be fatal, although chronic indolent forms are frequent. The myelophthisic condition of the bone marrow is probably a factor.[29]

Both these congenital anomalies of bone development have a hereditary and familial incidence. The mineral metabolism is not definitely or significantly disturbed as far as clinical investigation can determine. Calcium, phosphorus, and phosphatase in the serum are usually within the normal range for the age of the subjects. Elevation of the enzyme occasionally noted may be in part owing to the frequency of fractures.[16]

Diaphyseal aclasis (multiple exostoses) is a congenital and familial anomaly chiefly affecting bones of cartilaginous ossification. The skull is affected in 6.6 per cent of cases and may be exclusively involved. Asymmetry occurs in every instance. Both the calvarium and the facial skeleton are implicated, and many of the cases have multiple involvement. The lesion is characterized by the irregular formation of new bone and osteoid, with resorption and remodeling of the preformed osseous tissue. Cranial deposits are usually more compact and dense than those involving the tubular bones. The teeth and jaws may be

affected by the process, with disturbances in dentition, interference with mastication even to the extent of fatal termination, abscess formation, pathological fracture, and secondary malignant transformation.[46, 50]

Multiple enchondromas may be associated with diaphyseal aclasis in about one-sixth of the cases. Both central and periosteal varieties occur. The latter may be confused with exostoses. Early manifestation is rather frequent, more than half the subjects being affected before the fifth year. The cranial bones and the mandible may take part in the process. This disease commonly is of congenital and familial distribution, although isolated forms occur.[46] Both dysplastic and neoplastic theories of its nature have been advanced.[29]

Cleidocranial dysostosis represents the complement to diphyseal aclasis in that the bones of membranous ossification predominate. It is also of congenital and familial incidence. The head and the clavicles are chiefly affected. Although the base of the skull is not involved in any important degree, the maxillae and the vault are significantly disturbed, and anthropometric studies reveal uniformly small facial dimensions. More than 28 per cent of the cases are characterized by a small or receding face in comparison with the cranium. High arching of the palate occurs in almost half the cases, and of these 6 per cent present other abnormalities including clefting and furrowing. There is relative prominence of the mandible with definite prognathism in more than 15 per cent.

The defective membranous ossification is also associated with disturbances in dentition. Retarded eruption (25 per cent), incomplete dental arches (33 per cent), irregularities (46 per cent), and caries (25 per cent) have been observed. Dental defects occurring in at least 55 per cent of the cases can be largely attributed to restriction of the erupting area by maldevelopment of the jaws.[46]

Achondroplasia (chondrodystrophia hypoplastica) is a true developmental skeletal disease of congenital and familial nature characterized essentially by dysplastic and atrophic or sclerotic processes in the epiphysial cartilage with premature synostosis of the bones of cartilaginous ossification in the base of the skull. Periosteal ossification is normal or even increased. Structural effects follow these changes in direct sequence. In the skull and facial skeleton these include smallness of the face exaggerated by prominence of the cranium, reduction of the angle of the base with shortening, and broadening of the bridge of the nose with retrusion of it as well as the maxillae. High arching of the palate may occur.

There is no gross disturbance of dentition with respect to either the complement of the arches or the sequence, although in cases with marked maxillary hypoplasia deformity occurs.[45] Calcium, phosphorus, and phosphatase content of the serum is normal.[16]

Ateleiosis is a type of congenital dwarfism also dependent on disturbances in the proliferation of epiphysial cartilage and ossification of the long bones. Other factors are aplastic and nondeveloping centers of ossification. The skull is affected and is of brachycephalic form resulting from the lack of growth of bone at the base and the persistence of the cartilage of conjugation throughout life. The appearance of the skull and face as well as the general habitus is

puerile. This is accentuated by infantilism due to lack of gonadal development. Persons developing the disease in childhood or before puberty may be less markedly affected. The face is short and broad; the bridge of the nose depressed, broad, and saddle shaped; the mandible and chin are small.

Dentition may be comparatively normal in cases developing late. More commonly the teeth develop irregularly with respect to both time and position.[45] This is particularly evident when deficient growth narrows the arches[26] and is exaggerated when the teeth are disproportionately large.[7]

Fetal bone growth disturbances of less common occurrence including lückenschädel, herniations, microcephaly, and fetal duplications are chiefly of teratological interest.[25]

Fissural disturbances of the maxilla and mandible and their resultant clefting have been long known and much described. Their significance is obviously important in the further development and function of a harmonious

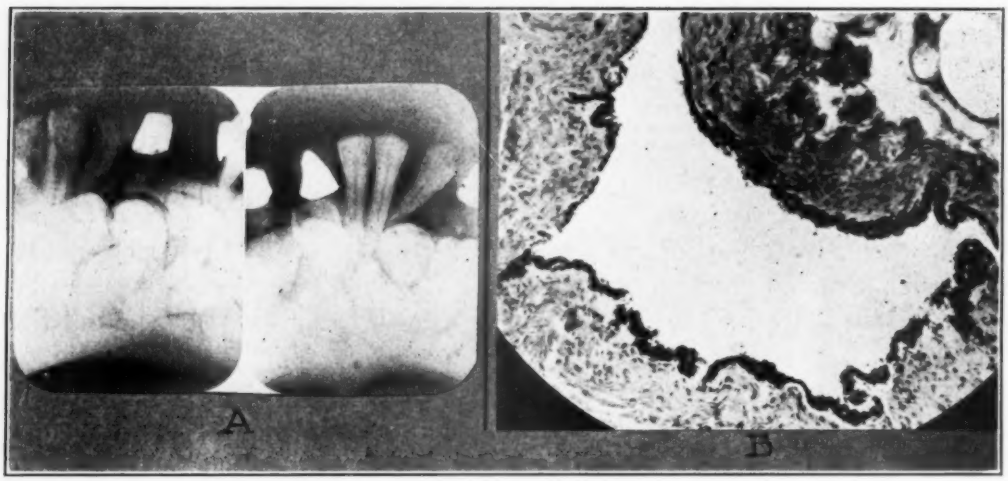


Fig. 3.—Supernumerary teeth: *A*, Disorganized multiple odontogenesis with disturbance in alignment of erupted teeth. *B*, Follicle sac remnant with well-defined epithelial lining representing odontogenic ameloblastic elements. Follicular, radicular and paradental cysts and ameloblastoma originate from such epithelial structures.

masticatory apparatus. They are not primarily owing to qualitative tissue change and consequently require no emphasis in the present consideration.[25, 48]

Supernumerary teeth and partial or complete anodontia need only passing mention as they are well-recognized factors in producing malocclusion (Fig. 3*A*).[1, 7, 11, 18, 52] The potential activity of their odontogenic epithelium in the formation of paradental and follicular cysts and occasionally ameloblastoma or ameloblastic carcinoma gives these anomalies further significance (Fig. 3*B*).[18, 19]

A survey of congenital, hereditary, and familial disease as related to oral pathology and orthodontia should conclude with some reference to the continuous and occasionally acrimonious debate as to the importance of these factors in producing malocclusion.[1, 7, 11, 22, 27, 30, 52] The gross effects of many of the conditions make their diagnosis obvious, and there are well-defined criteria, the demonstration of which should insure its accuracy. The distinction between

these and the more common forms of malocclusion is quite definite and should not be confused. Whether heredity, environment, or both, may be factors in the latter group is still an open question in need of special and patient observation and meticulous statistical evidence based on sound principles of genetic and biometric research.

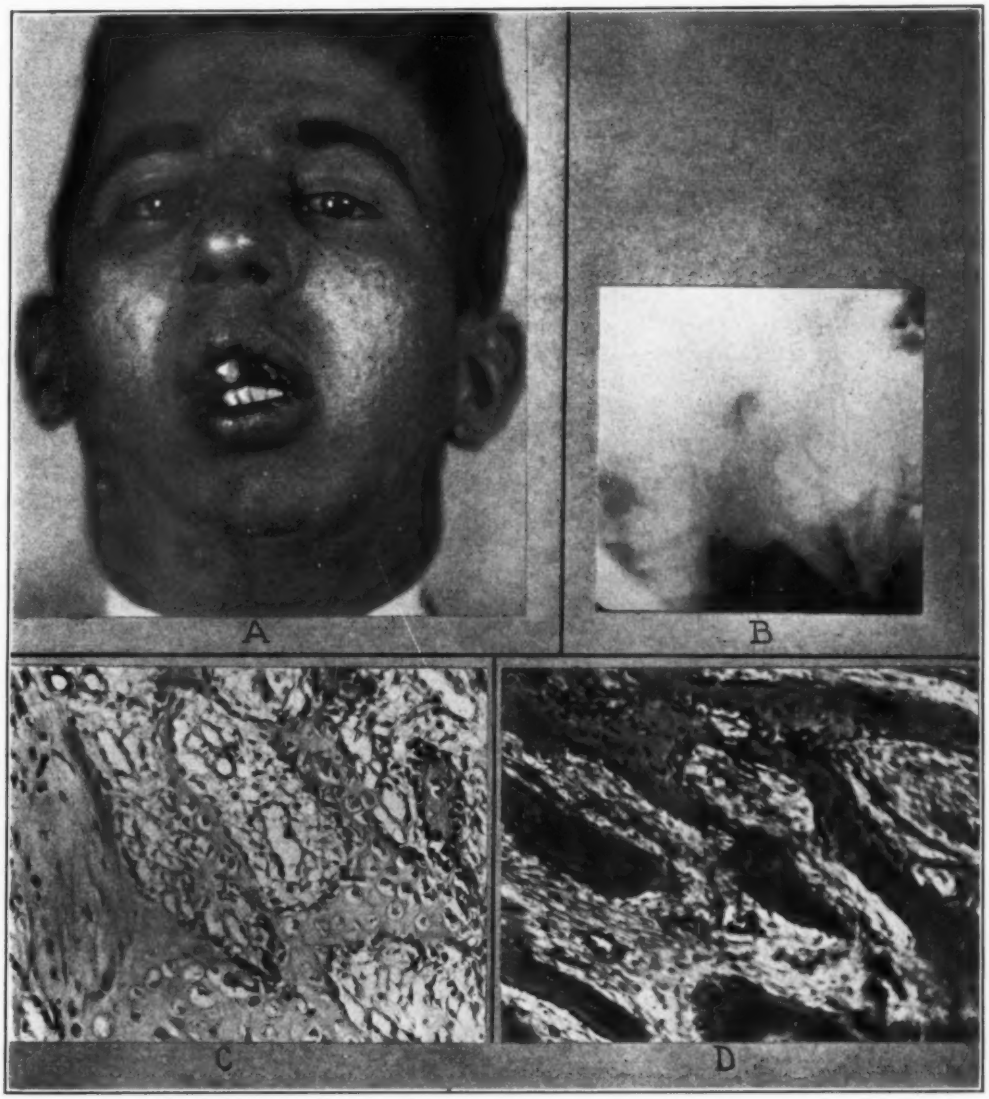


Fig. 4.—Fracture: *A* and *B*, ankylosis and deformity following trauma. Fracture, displacement, and atrophy with marked malocclusion. *C*, Excessive callus production with proliferation of mesenchymal connective tissue stem cells manifesting cartilaginous differentiation. *D*, Reactive bone formation.

ACQUIRED DEFORMITIES

Sutural disturbances of early infancy that may have eventual orthodontic significance occur. Various combinations of dysostosis produce modifications of the fundamental dolichocephalic and brachycephalic types. Plagiocephalus, oxycephalus, and hydrocephalus belong to this group.[48] Their chief importance resides in their secondary effects on occlusion and articulation and pathologic sequelae thereunto related.

Asymmetry due to intrauterine pressure or adhesions[7, 25] or birth trauma[42] may be transitory when of minor degree. Other injuries including disturbances of the temporomandibular joint with hemorrhage and organization have potential ankylosis (Fig. 4*A, B*) with atrophy and retarded mandibular development as a serious consequence.[11, 32]

Hemihypertrophy or *atrophy* of both the teeth and the jaws, manifesting itself in childhood, apparently acquired and of idiopathic nature, probably represents essential disturbances in development and ossification. They may be local or associated with partial or complete hemisomatic involvement. They are often attributed to hormonal and metabolic disturbances without adequate evidence but are more likely due to vascular neurotropic mechanisms.[13]

Habits have been so frequently emphasized as factors in producing malocclusion of various types depending on the nature of the etiologic agents, that it would be superfluous to elaborate on their implications.[1, 7, 11, 30, 31, 52] It must be remembered, however, that tissue changes are relatively structural—atrophic and hypertrophic—rather than definitely pathologic, and their normal reestablishment usually follows removal of the cause and orthodontic correction.

Traumas of fetal and natal types have already been mentioned. The same factors of pressure, traction, and their sequelae obtain in later life and are indeed the modalities of malocclusion resulting from habits. In the developing jaws and dentitions during infancy and childhood, injuries have more serious prognosis with respect to satisfactory end results, although related problems obtain in adults.

Fracture, with its fairly high incidence in young children and adolescents, is therefore of special importance. Involvement of the condyle with complete or partial ankylosis through traumatic arthritis (Fig. 4*A, B*); double comminuted types with displacement, excessive callus formation (Fig. 4*C, D*), malunion or nonunion; secondary osteomyelitis and sequestration with hypoplasia due to loss or atrophy of ossification centers; and disturbances in deciduous and permanent dentition may require oral surgery before orthodontic treatment can be expected to be advantageous. This is particularly true of cases with mandibular prognathism, unilateral or bilateral retrusion of the mandible, and those requiring arthroplasty.[2, 32] Calcium and phosphorus levels of the blood are not significantly changed in fracture. Phosphatase is normal early but becomes elevated with callus formation and ossification.[16]

Operative trauma following unsuccessful attempts to repair cleft palate may be responsible for underdevelopment of the maxillary arch with retrusion, overlapping of maxillae anteriorly with irregularity and malocclusion of the incisor teeth, delayed eruption and irregularity of the permanent dentition, and disturbance of nasal contour. Vascular impairment and fibrosis with secondary effects in the implicated structures represent the pathologic mechanism[32] in these as well as other operative failures such as pseudoarthrosis.

Malocclusion of intrinsic type has traumatic implication with respect to other teeth, the alveolar processes and gingivae, the jaws, and the temporomandibular joints (Figs. 5, 6, 7). Early stages produce relatively slight pathologic changes including hyperemia of gingiva, periodontium, apex, and

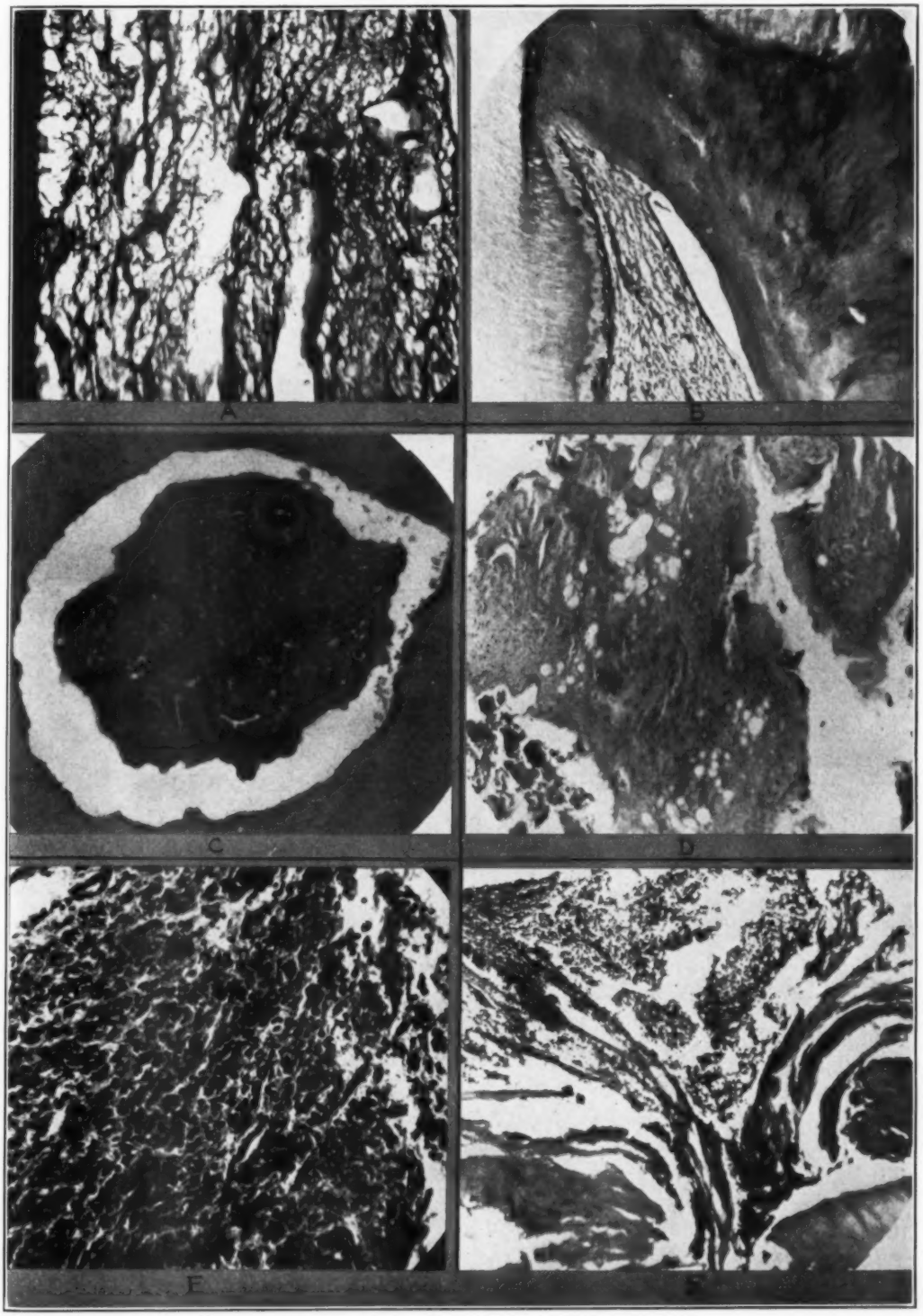


Fig. 5.—Changes in pulp with malocclusion: *A*, reticular atrophy of pulp; *B*, focal pulpitis; *C*, hemorrhage; *D*, fibrosis and fatty degeneration; *E*, diffuse pulpitis; *F*, fibrohyalinization, calcification, and necrotizing pulpitis with caries.

pulp. Secondary effects with alveolar atrophy and hyperplasia along lines of pressure and traction, gingivitis, and pulpitis follow. Necrosis of alveolar processes and pulp with periodontitis represents advanced forms which are frequently associated with spontaneous or operative tooth loss. Fraying, atrophy, and ulceration of the meniscus and atrophic and hypertrophic arthritis of the temporomandibular joint have been reported under such circumstances.[44] Malocclusion may then become an effect as well as the cause of pathologic processes involving the articular surfaces.

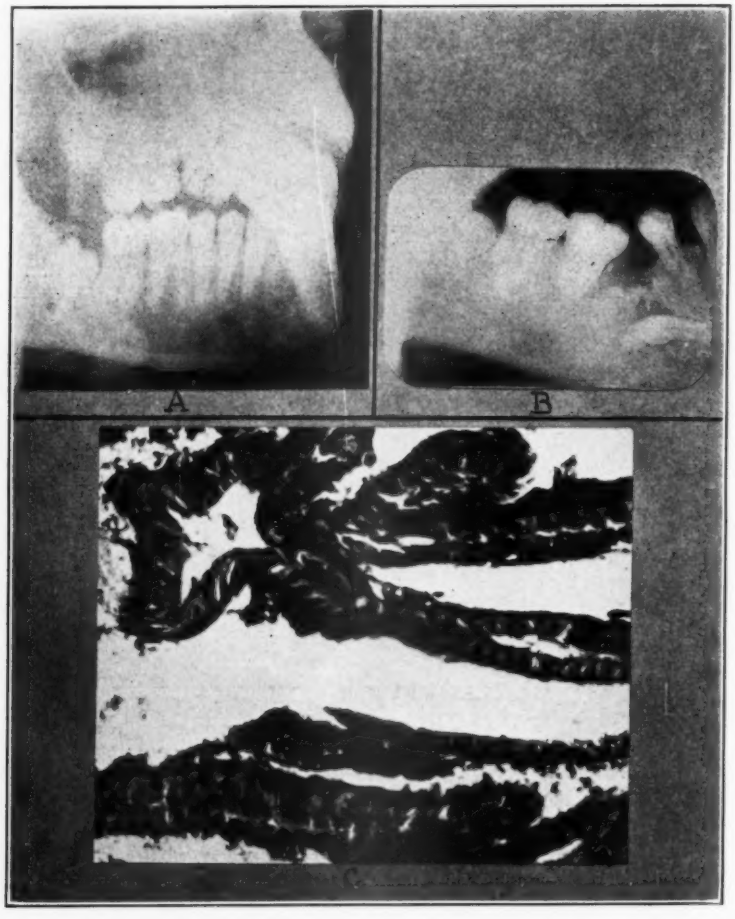


Fig. 6.—Malposed teeth associated with: *A*, adjacent unerupted; *B*, impacted and malposed teeth. *C*, Ameloblastic epithelium from the follicular sac remnant of an unerupted tooth.

Malposed, impacted, and *unerupted teeth* have interrelationship with numerous aspects of the conditions of mutual concern to orthodontics and oral pathology (Fig. 6). The congenital and familial diseases affecting the jaws and the skull have frequent disturbances in eruption and alignment of the teeth as secondary manifestations. Other factors associated with hypoplasia of the jaws present similar examples. The etiologic agents and mechanisms are heterogeneous and include traumas of congenital and neonatal type as well as those occurring in infancy and childhood as outlined; nutritional and hormonal disturbances influencing growth; metabolic and constitutional diseases with local

manifestations; osteodystrophy in its various forms; inflammatory and infectious processes of specific and nonspecific nature; and neoplasms (vide infra).

The effects of the dental derangement are essentially the same in most instances, although they may be complicated by secondary infection, vascular

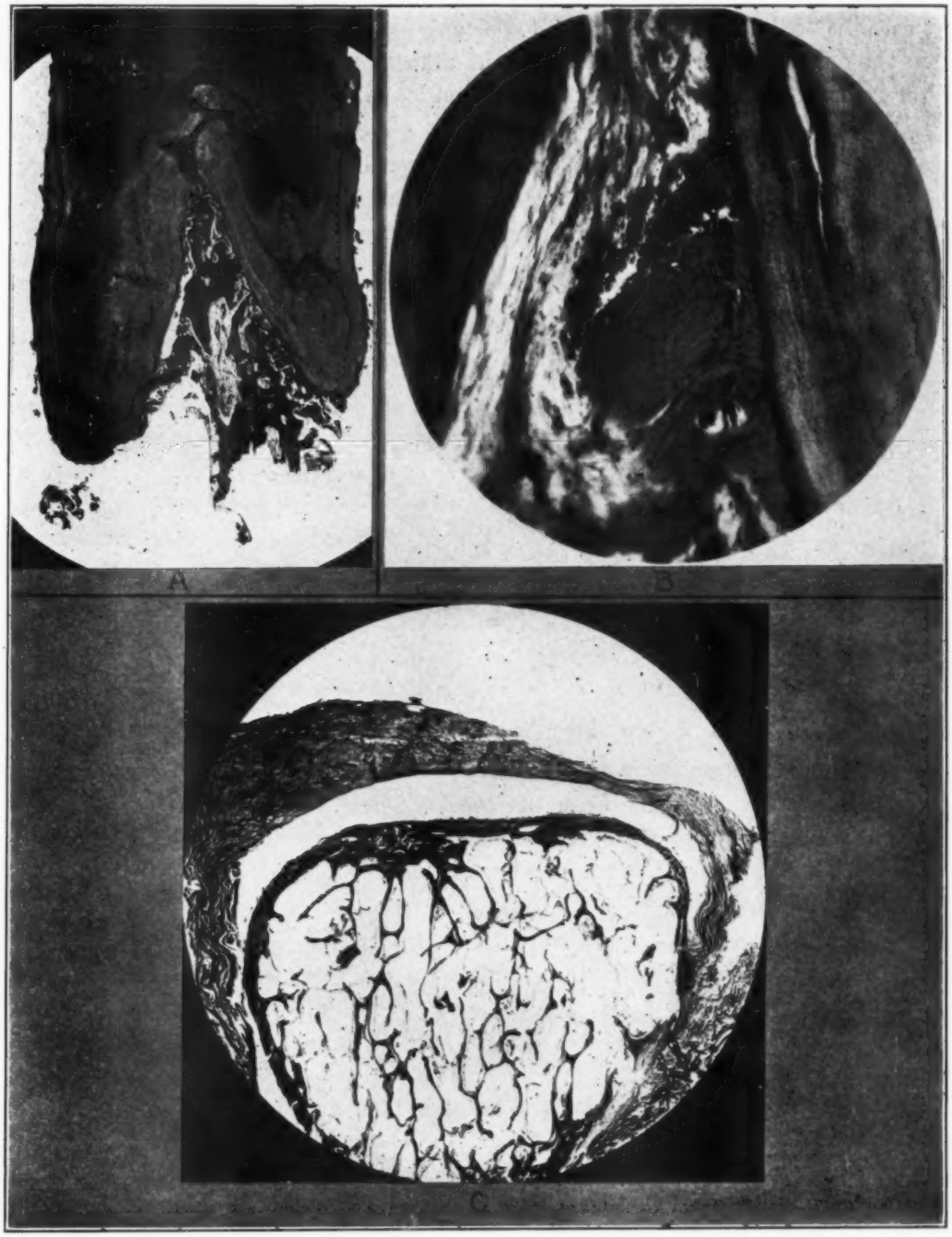


Fig. 7.—Changes in periodontium and temporomandibular articulation as noted in malocclusion: *A*, hypercementosis with microcomminution and hemorrhage and fibrosis of periodontium; *B*, detail of (*A*) with fracture of cementum, hemorrhage into and fibrosis of periodontium with widening; *C*, focal atrophy and adjacent hyperplasia of the meniscus of fibrocartilage and cortical bone.

disturbances, and bone dystrophy. Resorption of adjacent osseous trabeculae and the contact areas of roots against which the offending tooth may be impinged are frequent. Drifting and torsion follow. Further progress can eventuate in pathologic exfoliation. A condition of misalignment and malocclusion may therefore aggravate and extend itself by inherent disharmony. The possibility of the formation of follicular and paradental cysts and ameloblastoma in the enamel organ or remnants of the unerupted tooth and radicular cysts in the region of the injured root must be mentioned.[18]

Orthodontic trauma may be considered a special case of that due to malocclusion because it is essentially only its obverse. The same lesions may occur for identical reasons. Modern technique respects the biologic approach[7, 22,30, 37] to the understanding and correction of malocclusion based on experimental[20, 40] and clinical observations.[17, 35, 40, 47] With appropriate precautions, untoward effects should be minimized.

Caries may be associated with local disequilibrium of the adjacent teeth and their opponents. Painful occlusion associated with concomitant pulpitis and periodontitis may establish faulty masticatory habits[30] and also initiate a series of changes leading to malocclusion and tooth loss. The condition, therefore, has orthodontic significance from several aspects. Hereditary, familial, and metabolic as well as local and bacteriologic theories have been advanced to explain the underlying causes of the pathologic disturbance. Only the morphologic facts of the disease are uniformly accepted.[16] These should receive appropriate attention whether they occur before, during, or after orthodontic treatment.[47]

DISTURBANCES OF GROWTH AND METABOLISM

The Endocrine Glands

Congenital, hereditary, and familial conditions of several varieties of growth disturbance have already been reviewed. Local forms of hypertrophy and atrophy have also been considered separately because of their different etiologies. Other types of general effect may have relationship to orthodontics, oral and general pathology, and internal medicine.

Gigantism due to hyperpituitarism before the completion of ossification is not usually associated with orthodontic problems because of the uniformity of the process. The tissues are merely increased in quantity, although it has been reported that the teeth are of variable and often poor quality. Calcium and phosphorus are normal.[16]

Acromegaly is a hyperplasia manifesting itself in a bizarre manner due to the fact that the hyperpituitarism acts secondarily on organized adult structures. The reactivation of growth effects changes in the skull and jaws which produce definite osseous, dental, and occlusal disequilibrium (Fig. 8*A*). Early cases of slow ingravescence may come to orthodontic attention[26] before obvious and hopeless deformity supervenes, when only prosthetic measures can be useful. Mandibular effects are particularly notable and depend on the growth impetus expressing itself at the temporomandibular cartilage, the periosteum

and the alveolar bone (Fig. 8*B*). The increment of length of the ascending ramus with deposition and resorption at the angle along with increase in its obtuseness produces the prognathism which is one of the characteristic features of the disease.[29, 33] The macroglossia and macrocheilia may also be factors in producing this effect. High arching of the palate is a manifestation of the osseous changes implicating the maxilla. Periosteal activity results in thickening. Alveolar processes of both the maxilla and the mandible participate in an irregular manner so that protrusion and separation of the teeth occur. Apical resorption has been observed.[4] The process of ossification is essentially normal, although some irregularity of the proliferating zone of cartilage cells and the line of ossification is evident. Slight disproportion in resorptive mechanism is responsible for initial porosity as well as late atrophy, which is an expression of the hypopituitarism which follows the active phase.[33] Calcium and

Fig. 8.—Acromegaly: *A*, marked prognathism with malocclusion; *B*, irregular proliferation of cartilage and formation of osteoid and new bone.

phosphorus levels in the blood are within the average range, although a positive calcium balance obtains. Slight elevation of phosphatase to twice the normal value has been observed.[16]

Hypopituitarism is associated with several clinical syndromes that have orthodontic implication. Progeria is considered to be a form of hypofunction manifesting itself early. Although rare, it is of interest because of the engrafting of the characteristic appearances of senility on infantilism. There is profound arrest of palatal growth and relatively less delay in dentition than in other forms of infantilism, as a result of which marked distortion and irregularity of the permanent teeth occur.[7] Other varieties of infantilism of ateliotic type may be due to hypopituitarism and have features similar to purely congenital, hereditary, or familial forms. They may present similar orthodontic problems. There is no definite indication of a disturbance of mineral metabolism.[16]

Hypogonadism with dyspituitarism and adiposodystrophia genitalis may be associated with broad and malformed teeth, hypoplasia of the jaw, tendency to caries, apical resorption, and malocclusion.[4, 12] The calcium and phosphorus values are not significantly changed.[16]

Hyperthyroidism of chronic or more severe, acute type is accompanied by general osteoporosis, atrophic dystrophy of the alveolar processes with apical resorption,[4] and marked changes in mineral metabolism. Alveolar resorption may be associated with gingivitis[51] and its sequelae. A negative balance of calcium and phosphorus occurs even though serum values are essentially normal. Phosphatase is elevated from two to six times the usual values.[16]

Hypothyroidism as manifested in cretinism has many features in common with ateleiosis, including nonunion of the epiphyses and persistence of the cartilage of conjugation, infantilism, and the puerile habitus.[45] Although the skull is essentially symmetrical, the relative enlargement of the mandible is asso-

Fig. 9.—Hyperparathyroidism; *A*, bone cyst with epulis on physical examination; *B*, resorption of bone of alveolar processes; *C*, focal rarefaction of alveolar bone.

ciated with prognathism in many of the cases. Macroglossia and macrocheilia are also frequent. Incomplete and retarded permanent dentition is accompanied by hypoplasia and malocclusion.[7, 12] Caries occurs in almost half the cases.[34] Low values of serum phosphatase increasing with the administration of thyroid substance have been reported.[16]

Hyperparathyroidism produces a generalized bone disease frequently associated with local manifestations in the teeth and jaws (Fig. 9). Although *osteitis fibrosa generalisata* had been well known clinically and pathologically for some time, the recent advances in endocrinology and physiological chemistry were necessary before the present understanding of the etiology and mechanism of the condition could be achieved.[41] Earlier forms of the disorder are being diagnosed and treated, and the advanced stages with hopeless deformity should never again be permitted to occur (Fig. 9*A*, *B*, *C*). The essential features of its pathologic physiology depend on the excessive parathormone secretion usually elaborated by adenomas but also with hyperplasia of the parathyroid glands.

Hypercalcemia, hypophosphatemia, a negative balance of calcium and phosphorus, and increase of serum phosphatase are constant findings. The severe loss of minerals results in osteoporosis with formation of multiple cystic lesions in the bones and pathologic fractures often after slight trauma. Changes in the structure of the teeth with malformation and resorption are dependent on similar demineralization. The jaws, like the other bones, may be affected by

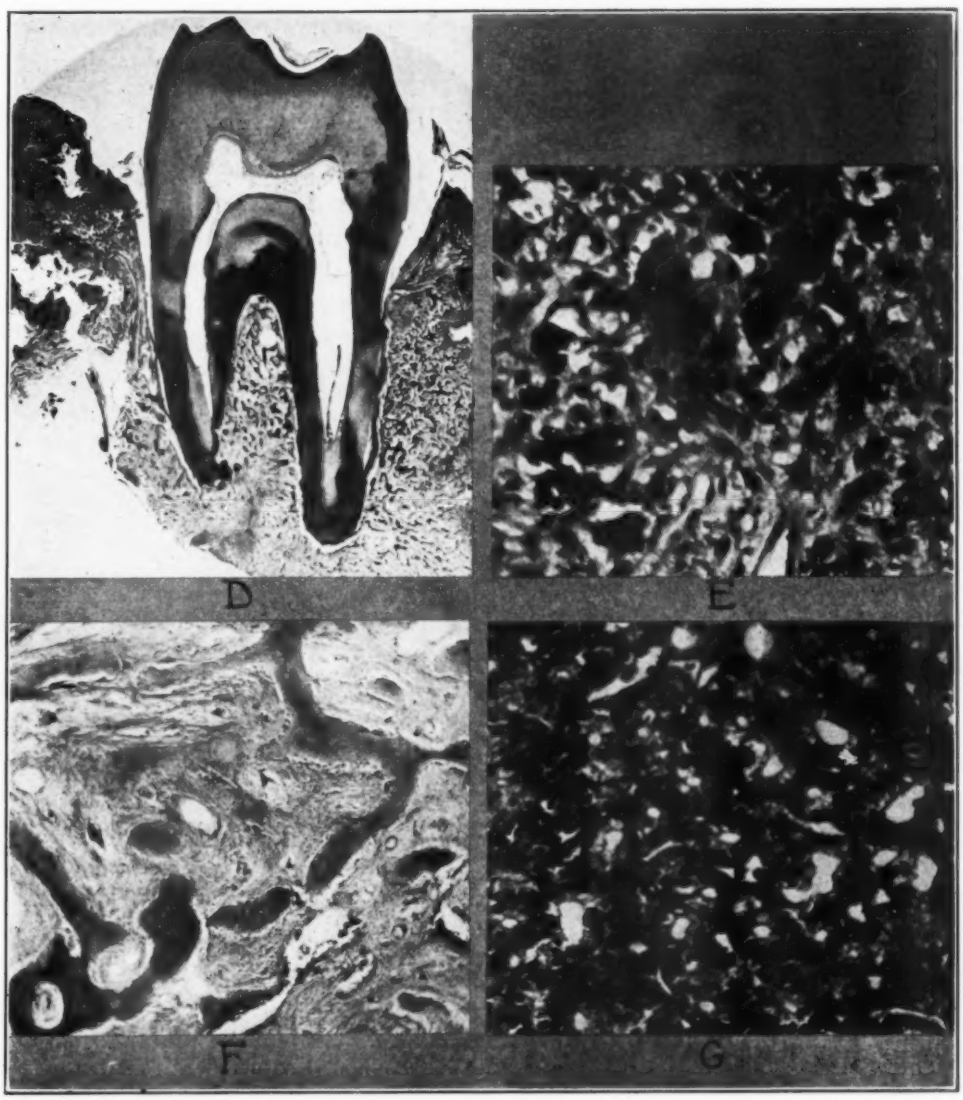


Fig. 9.—Hyperparathyroidism; *D*, Epulis formation at gingiva, extensive resorption of alveolar trabeculae, and fibrosis (same case as Fig. 9*A*). *E*, Giant cell tumor appearing as epulis in osteitis fibrosa generalisata (see Fig. 9*A* and *D*). *F*, Higher magnification of *D* with typical field of osteitis fibrosa. *G*, Adenoma of parathyroid gland. Its removal was followed by spontaneous healing of generalized osteitis fibrosa cystica (same case as Fig. 9*A*, *D*, *E*, *F*).

the processes of resorption of trabeculae, fibrosis of marrow, giant cell tumors occasionally simulating the isolated osteoclastoma or giant cell epulis, and cysts (Fig. 9*D*, *E*, *F*). Loosening and displacement of the teeth may be attributed to gingivitis, which is only another symptom depending on alveolar resorption and not causing it. The regression of the disease follows excision of the adenoma

(Fig. 9*G*) or reduction in parathyroid substance. Any sequelae in the teeth or jaws in need of orthodontic or other dental attention may then be treated with confidence that the procedure is being appropriately directed to a local condition and not a constitutional derangement of mineral metabolism.[16, 19]

Adrenal and *pineal tumors* of rare incidence may be accompanied by precocious sexual and somatic development in young subjects. The teeth are also affected. Details of orthodontic problems are not sufficiently well reported to permit evaluation. It is altogether likely that they exist, as the jaw development is not comparable to the other changes, which are chiefly muscular and genital.[12] Adult values for calcium, phosphorus, and phosphatase in the blood are encountered.[16]

There has been an unfortunate tendency to ascribe local hypertrophy and atrophy affecting the jaws and associated with various types of malocclusion to hormonal influences. The data are frequently casual and incomplete, and the conclusions occasionally fanciful or speculative. Such reports have been justly criticized.[7] No evidence of local, purely selective action of the hormones on the teeth or jaws has been adduced. The possibility of slow ingravescence with temporary preponderance of isolated effects as well as arrested or abortive syndromes must be admitted, but with circumspection and the support of well-authenticated endocrinologic and clinical research.

Nutrition

The dependence of growth, function, and repair on well-balanced diet has been much stressed in dental literature, and its importance needs no special recapitulation. Certain aspects of this complex field have a definite bearing on oral pathology and orthodontics, and deserve mention. In view of the interdependence of many of the essential nutrients it would probably be advantageous to consider them in the general terms of their deficiency states, as these give evidence to illustrate the operation of combinations of factors in several instances.

Rickets is a bone dystrophy of nutritional origin in which deficiency of vitamin D affects the absorption and utilization of calcium and phosphorus and produces disturbances in the processes of calcification. It has definite effects on the skeleton and teeth, although the jaws are less notably involved than the long bones, changes in which may produce dwarfism.[24, 29, 45] Although cranial deformity is a prominent clinical feature, the significance of the disease in the jaw and its relationship to malocclusion have been controversial.[7, 14, 21, 29, 48]

The disturbances of ossification are characterized by irregular proliferation of cartilage cells, failure of resorption, disorientation of the relationship between the zone of bone trabeculae and its preparatory calcifying zone with the predominance of osteoid tissue (Fig. 10*A*). Similar failure of calcification affects the intramembranous type of ossification with osteoid deposition at cortex and spongiosa. The resulting bone dystrophy and softening are responsible for many of the structural deformities so characteristic of the disease in the long bones. Although the jaws take part in the general process, there is no definite evidence that any particular or notable deformity can be attributed to it. Surveys undertaken to yield such data have not been able to demonstrate mal-

occlusion or jaw changes that cannot be duplicated through other etiology.[14, 21] Delayed eruption of deciduous teeth, with hypoplasia, high incidence of caries, and premature loss are observed, however. They can be associated with faulty development due to atrophic and degenerative changes in their formative stages through the nutritional influences on differentiation and growth of enamel, dentine, and bone.[16, 17] The eruption of the permanent teeth is also delayed.[24] Malocclusion has been noted in conjunction with factors that may be attributed to premature loss of teeth rather than actual structural deformity of the arches.[14]

Calcium, phosphorus, and phosphatase values in the blood are changed in several important characteristics. All children under the age of two and a half years with phosphorus values of 3.0 mg. per 100 c.c. have been found to have evidence of active rickets. A calcium phosphorus product of less than 40 is of similar significance. Calcium is usually normal except when there is tetany, when values of 5.8 mg. per 100 c.c. obtain. Phosphatase levels depend on the stage, duration, and severity of the disease, varying from two to forty times the

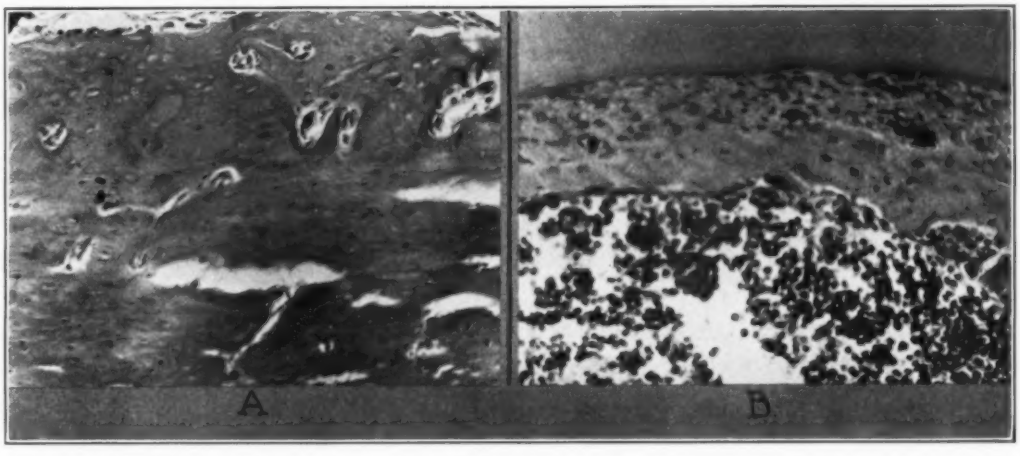


Fig. 10.—Nutritional dystrophy: *A*, rickets with marked osteoid production and minimal calcification; *B*, osteoporosis with marked attenuation of lamina dura.

normal, with diminution on recovery. Low positive, normal, and negative calcium and phosphorus balances occur when definitely positive balances should obtain in growing children.[16]

Osteomalacia, porotic and malacic forms of hunger osteopathy have many features that relate them to rickets as a nutritional bone dystrophy. Renal and celiac rickets may be considered variants depending on secondary factors interfering with calcium and phosphorus metabolism rather than nutritional disorders per se.[16] Malformation, displacement, and loss of teeth with subsequent malocclusion occurring in the course of these diseases are merely local expressions of the general osteodystrophies (Fig. 10*B*).

Scurvy is a deficiency disease that seldom appears in its severe forms because of the fact that most diets contain sufficient vitamin C to prevent its full expression. Failure of mesenchymal cells to elaborate their characteristic intercellular substances is the essential feature that accounts for both pathologic and clinical manifestations.

Loosening, drifting, and loss of teeth are due to changes in the alveolar bone and gingivae. Disturbances in the morphology of the teeth are usually noted only in advanced cases or experimental animals, but may be factors of orthodontic significance after earlier attacks.[6, 23] The resorption of alveolar processes is owing to osteoblastic dysfunction with attenuation of trabeculae and widening of the cancellous spaces. Myxoid degeneration of fibrous tissue of the marrow represents the dystrophic effect of the vitamin lack on the fibroblast. Hemorrhages in the bone and gingiva are due to capillary fragility through disturbance in the endothelial cement substance and are aggravated by the trauma of mastication. The marked odontoblastic degeneration with subsequent changes in the dentine is capable of producing tooth deformity.

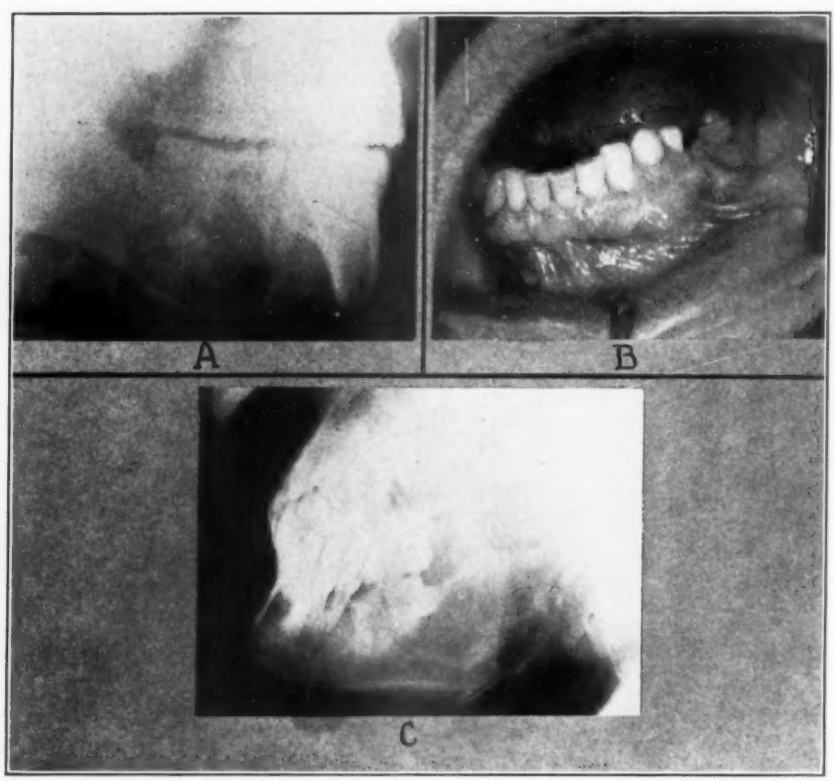


Fig. 11.—Osteitis fibrosa localisata. *A*, Large irregular area of rarefaction; *B*, tumefaction of alveolar arch with retrusion of teeth in involved area; *C*, irregular cystlike area of rarefaction.

Calcium and phosphorus are present in the blood in normal amounts. Phosphatase is depressed early in the course of the disease but increases on healing.[16] Vitamin C excretion in the urine is characteristically low but also increases after administration of the vitamin and healing.[36]

Other Dystrophies

Lipodystrophies including Gaucher's, Niemann-Pick's, and Hand-Schüller-Christian's diseases may affect the bone marrow and skeleton in the course of their operation. Only the latter has sufficiently common or extensive involvement of the skull and jaws to have orthodontic or oral pathologic interest. The

deposition of cholesterol in macrophages and the formation of granulomas in the marrow spaces are associated with osseous resorption.[43] When this occurs in the jaws, the atrophic and weakened trabeculae are unable to support the teeth, which loosen, drift, and exfoliate.[29] Gingivitis is probably secondary to the underlying bone disturbance. Less advanced cases have malposition. Facial and cranial bones are also affected and have characteristic radiolucent markings.[48] Implication of the pituitary gland and orbit as well as other constitutional effects is symptomatic of the widespread nature of the disease.

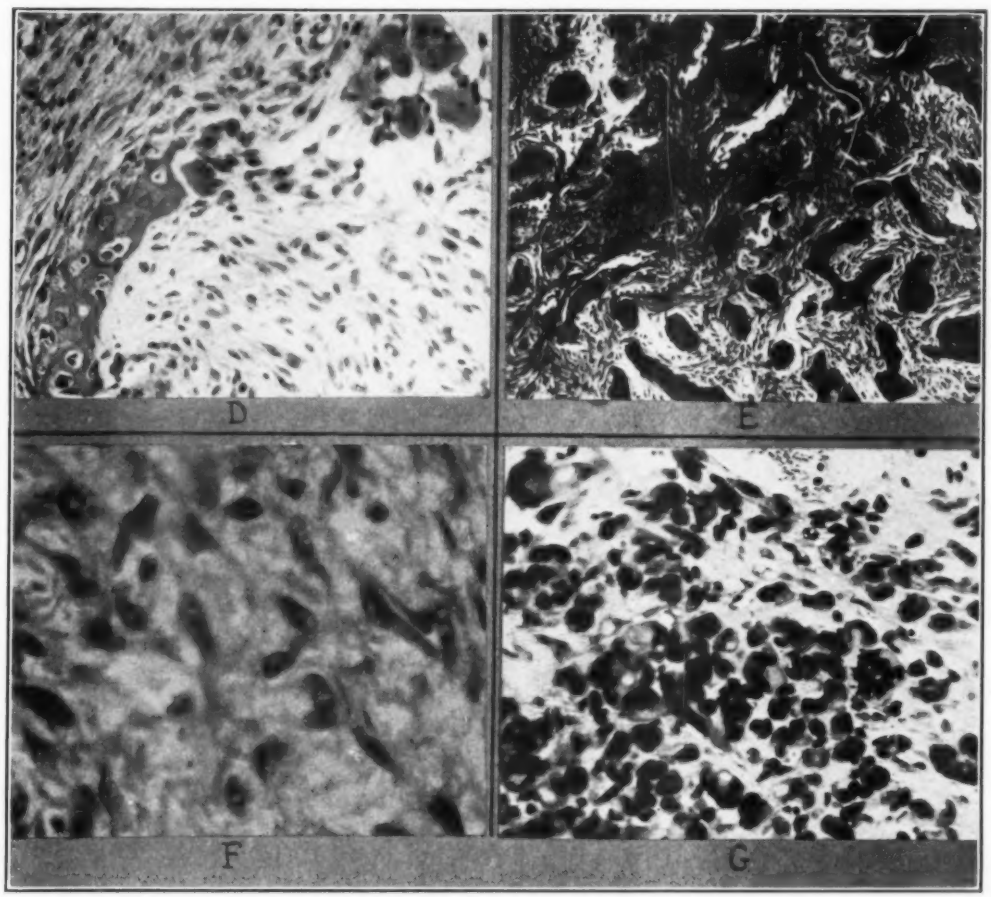


Fig. 11.—Osteitis fibrosa localisata. *D*, Resorption of bone by fibrocellular tissue and multinucleated osteoclasts; *E*, cellular area of local osteitis fibrosa; *F*, atypism of cells; *G*, malignant mesenchymal tumor developing after eight years and proving fatal (see Fig. 11*A* and *E*).

Fibrous osteodystrophy (osteitis fibrosa localisata) of localized type occurs in the jaws as well as the long bones (Fig. 11). It may present serious difficulties in diagnosis to the orthodontist who may be concerned with its early manifestation in the form of tooth malposition. More advanced disease with tumefaction usually comes to the attention of the oral surgeon (Fig. 11*A*, *B*, *C*). Here again its differentiation from other bone dystrophy and neoplasm may be uncertain on clinical and roentgenographic data. Biopsy and investigation of serum calcium, phosphorus and phosphatase should indicate the nature of the process. There is no disturbance of mineral metabolism, and these

values are normal.[16] The fibrocellular connective tissue often rich in giant cells of foreign body type may simulate central giant cell tumors and epulis histologically (Fig. 11*D*). The marrow fibrosis and trabecular resorption are nonspecific and may be noted in other osteodystrophies (Fig. 11*E, F*). Cyst formation may occur. Under such circumstances of potential misinterpretation, full cooperation of orthodontist, oral surgeon, roentgenologist, pathologist, and internist may be necessary in localized as well as generalized osteitis fibrosa.

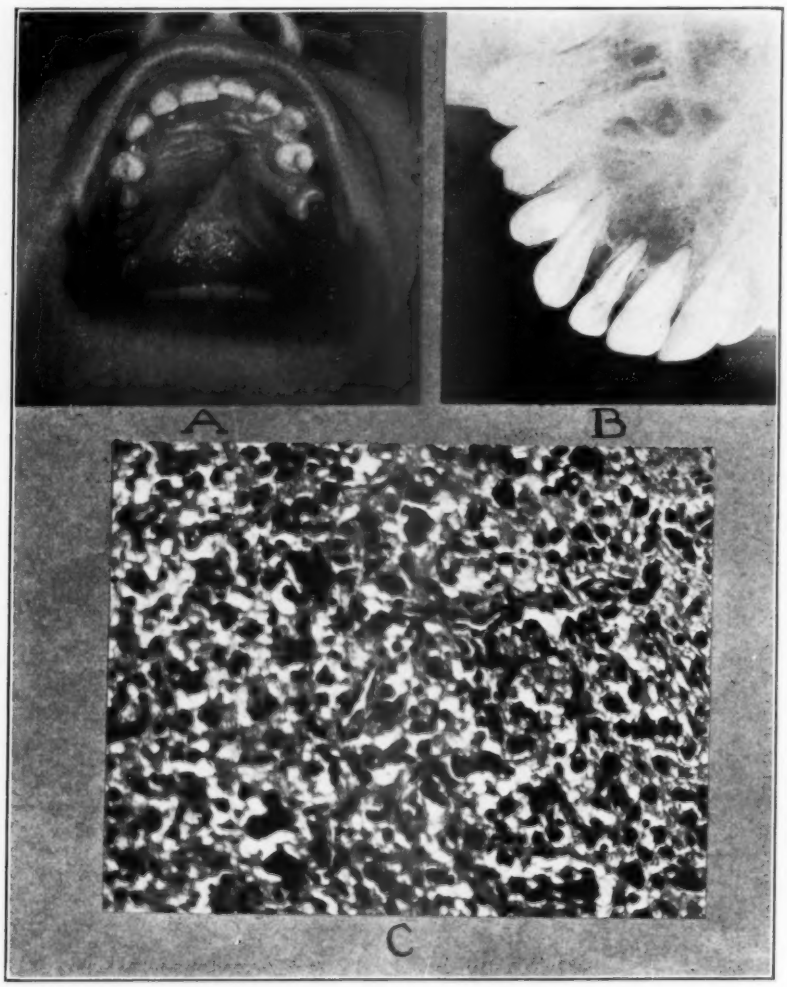


Fig. 12.—Central giant cell tumor (osteoclastoma): *A*, tumefaction distorting palate and alignment; *B*, circumscribed rarefaction; *C*, fibrocellular tissue with numerous giant cells of foreign body type.

Orthodontic problems may have to be met postoperatively on an entirely different basis of approach. The possible recurrence of these lesions in more cellular, aggressive, and even malignant forms (Fig. 11*G*) with further bone destruction and secondary dental disturbance as symptoms must be emphasized.[19]

Giant cell tumor of localized isolated type occurs as an epulis in children and young adults, in association with loosening and disturbances in the exfoliation of deciduous teeth and as slowly progressing forms of the osteitis that attends such changes in the permanent dentition (Fig. 12). It is therefore of

orthodontic significance because of the onset and course. Even though histologically similar to the giant cell areas in osteodystrophy (Fig. 12*C*) occurring in both local and generalized osteitis fibrosa, its relationship to the clinical syndrome clarifies the nature of the process. The central form of giant cell tumor is related to another variety of excessive resorption activity often due to cartilaginous remnants.[15] Further observation is advisable in view of possible recurrence after surgery or radiotherapy.[19] Calcium, phosphorus, and phosphatase are normal for the respective age levels.[16]

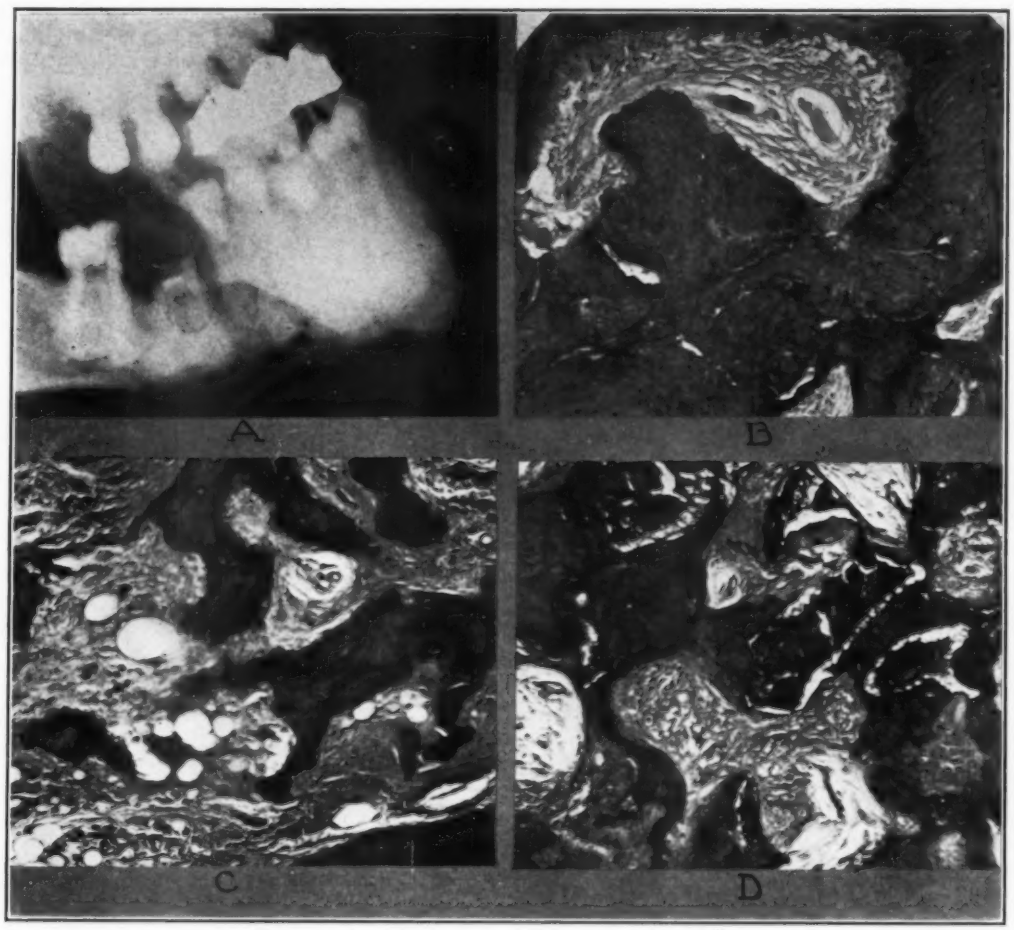


Fig. 13.—Osteitis deformans (Paget's disease): *A*, sclerosing lesions of maxilla and mandible; *B*, fibrosis of marrow, irregularly formed and calcified trabeculae with deposits of osteoid tissue; *C*, irregular trabeculae with dense curvilinear cement lines, fibrosis of marrow and irregular resorption; *D*, similar features as in *C*, but with aseptic necrosis of bone.

Osteitis deformans (Paget's disease) is more frequent in adults than in children and usually manifests itself in more obvious disturbances than by involvement of the jaws and malposition of the teeth. Yet cases have been reported in young subjects in whom maxillary involvement, irregularity of the teeth, and malocclusion were presenting symptoms.[28, 48] Fully advanced cases with extensive cranial and maxillary disease may have these as incidental sequelae (Fig. 13*A*). The striking increase in the thickness of the calvarium as well as the hyperostosis of the alveolar processes, the maxilla, and occasionally

the mandible is due to irregular osteoblastic, fibrosing, osteolytic processes that characterize the histopathologic changes in the bones (Fig. 13*B, C*).[8, 29] Impaired vitality of tissue may produce aseptic necrosis and be associated with sequestration (Fig. 13*D*).

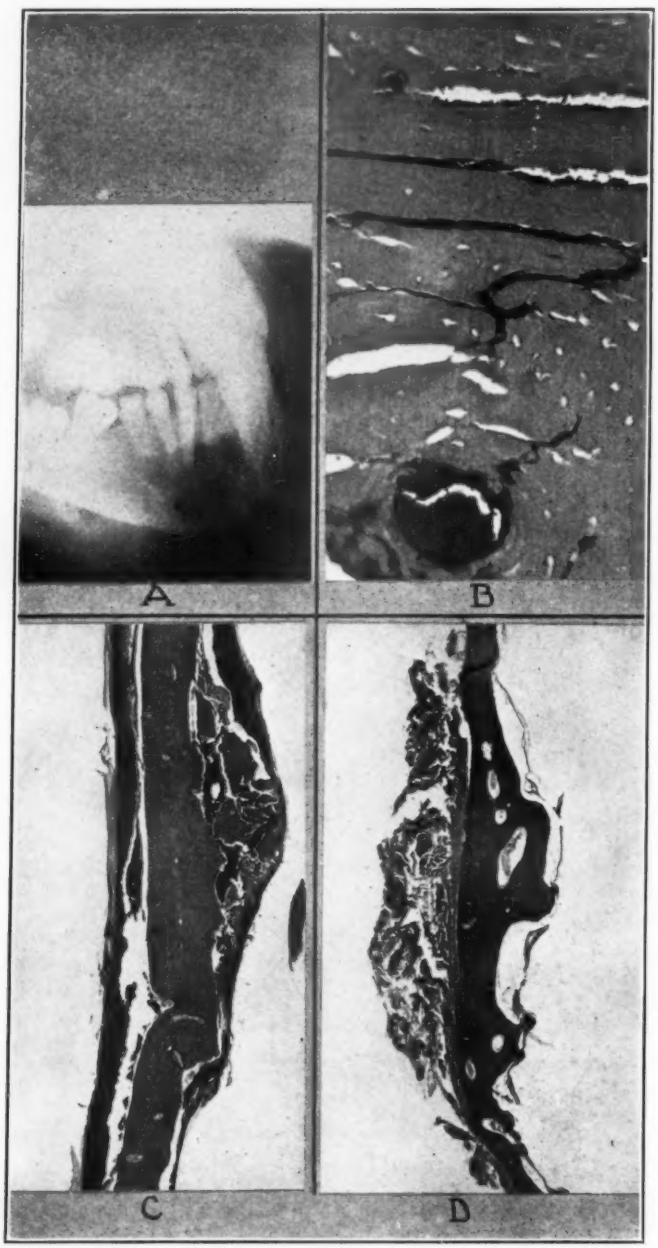


Fig. 14.—Osteitis cystica hemorrhagica (traumatic bone cyst): *A*, cystlike rarefaction; *B*, microcomminution with hemorrhage; *C*, irregular resorption of bone with detritus in situ; *D*, irregular resorption of bone with detritus removed and a festooning of trabecular prominences by fibrous tissue.

Calcium and phosphorus values of the serum are usually normal. Phosphatase levels vary considerably and depend on the extent, ratio of sclerosis and severity of the disease. Values from normal to an elevation of fifty times this

have been reported.[16] The possibility of complication by osteogenic sarcoma particularly in cases with skull involvement requires careful observation.[19] *Leontiasis ossea* has clinical and histopathologic resemblance to osteitis deformans and may represent a local maxillary variant.[28]

Osteitis cystica hemorrhagica (traumatic bone cyst) as a result of infraction and medullary hemorrhage is noted in the mandibles of young subjects (Fig. 14*A*). It is occasionally asymptomatic and may be first recognized on routine roentgenographic study of the jaw taken for other reasons. The large area of radiolucency could be mistaken for odontogenic cyst, localized osteitis fibrosa, and other rarefying lesions. Structural impairment of the bone may be extensive and can be responsible for secondary orthodontic effects. Surgery is indicated to establish the nature of the process as well as to restore bone contour. The wall is characterized by osteoclastic activity and fibrosis involving comminuted or attenuated trabeculae (Fig. 14*B*, *C*, *D*).[19] Any orthodontic treatment necessary may be instituted after healing. No changes are noted in the mineral metabolism as the lesion is purely local.[16]

INFLAMMATION

The wide range of etiologic factors associated with inflammation and their effects on the teeth and jaws has already been partly indicated. It must be emphasized that these are of primary significance. The pathologic lesions affecting the structures are of clinical as well as histologic interest. Their description and classification are important and have received considerable attention, with the accumulation of an extensive literature. A general survey restricted to inflammation alone could be useful and illustrative of the close relationship between oral pathology and orthodontics.

It is preferable, however, to particularize the discussion. This has been suggested in the consideration of various forms of trauma, their concomitant lesions, complications and sequelae; disturbances in the teeth, periodontium, and gingiva of dental and orthodontic significance; the metabolic and endocrine diseases; and the dystrophies of bone—all of which are examples of reaction of tissue to noxious agents and influences.

Pathologic lesions are representative of several types of tissue change and should have the advantage of careful study even when they are nonspecific. Biopsy may be a valuable aid in resolving difficult problems. The correlation of all the data available should extend the understanding of the implications of the disease process. In this the clinician's position should be a focal point for analysis and synthesis.

Gingivitis of initial stage need not be considered a serious factor in affecting dental alignment. On the contrary, it has significance for the orthodontist when it is caused by traumatic occlusion or other derangements of the arches and is an important symptom indicating the need for attention (Fig. 15).

Periodontitis and the involvement of the alveolar processes are occasionally owing to extension of gingivitis. They can be the original lesion and implicate the gingiva secondarily, as in the osteodystrophies.[51] The changes in the supporting structures have potential orthodontic manifestation in torsion, tilting, drift-

ing, loosening, and tooth loss. As in gingivitis, all these manifestations may be owing to disharmony of the integrated masticatory apparatus as well as the cause of it (Fig. 15). Under such circumstances the alleviation or correction of the orthodontic condition may be expected to be followed by diminution of hyperemia, regression of exudation, and the establishment of productive reparative activity.

Osteitis frequently occurs in conjunction with inflammation of the adjacent structures when it has the same features and implications. There is a tendency for the condition to assume a progressive course which may then become relatively independent of the more superficial lesions and continue after the latter have regressed. Both rarefying and sclerosing forms exist. These lesions may be present either separately or in combination (Fig. 16).

Those with predominance of fibrosis and osseous resorption frequently simulate the lesions of osteitis fibrosa localisata which indeed may be one of their expressions, although it also occurs as an idiopathic entity. Regression of the

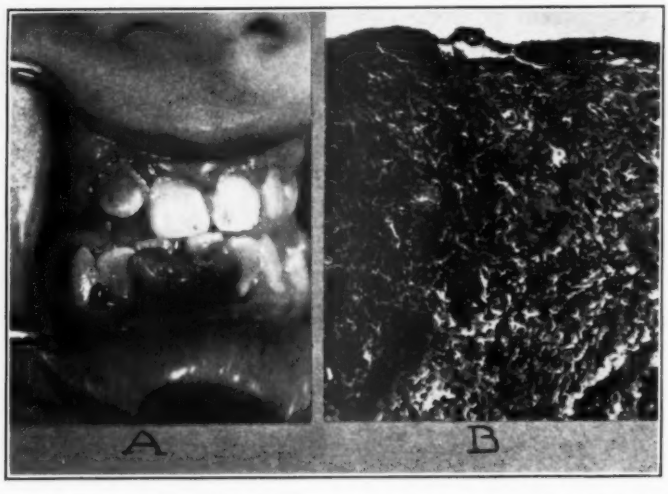


Fig. 15.—Gingivitis, periodontitis, and epulis formation associated with malposition of teeth: *A*, epulis of polypoid type arising from the gingiva and periodontium; *B*, subacute and chronic gingivitis and periodontitis.

exudates in late stages of the process may leave bulky masses of collagenous fibrous connective tissue similar to fibromas and occasionally indistinguishable from them (Fig. 16*C*).

The sclerosing type with metaplastic ossification, irregular calcification, reworked fiber bone, and focal resorption often has striking resemblance to the hyperostotic osteodystrophies from which it may not always be differentiated on local roentgenologic or histologic evidence (Fig. 16*D*). These lesions have also occasionally been described as neoplasms. In cases without previous observation, and the history of a slowly enlarging tumefaction, presenting in the sclerotic stage of chronic productive osteitis, it is not difficult to understand how the lesion could be misinterpreted.[19]

Calcium, phosphorus, and phosphatase levels in the blood are normal. This may prove a helpful aid in the diagnosis of these conditions when other evidence is conflicting.[16]

INFECTION

The inflammatory processes already considered are occasionally caused by various strains of microorganisms or may be complicated by secondary infection as tissues of lessened resistance to the saprophytic normal bacterial flora of the oral cavity. Here immunologic and bacteriologic factors must enter into consideration.[3] The resistance of the host and the virulence of the organism are of fundamental general significance. Local factors such as traumatic occlusion may have additional influence on the course of the disease.

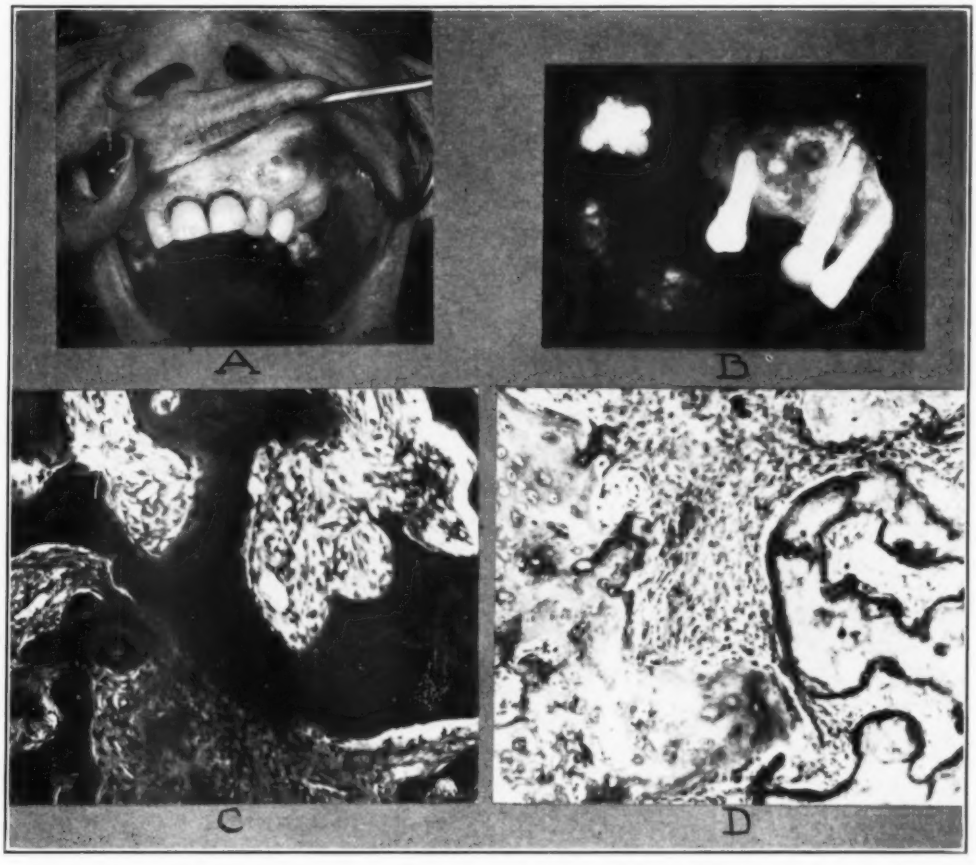


Fig. 16.—Osteitis with malposition of teeth probably secondary: *A*, tumefaction involving the alveolar ridge and buccal plate with malposition of teeth; *B*, x-ray picture of operative specimen with irregular areas of decreased and increased density; *C*, peripheral area with attenuated trabeculae, adjacent fibrosis of marrow and irregular formation of osteoid and new bone; *D*, resorption of secondary bone, fibrosis of marrow, and dense irregular trabeculae of new bone.

Suppurative inflammation in the gingiva and the periodontium is associated with more exudation, hyperemia, edema, and necrosis. The possibility of extension to the underlying bone is more real. Prognosis as to restitution of the tissues to their previous status is less favorable. This is particularly important when such lesions occur in the deciduous dentition (Fig. 17).

Abscess formation may supervene in cases with sufficient exudation and necrosis. The loss of teeth and bone structure in the course of surgical intervention may have definite orthodontic significance in young subjects (Fig. 17*D*).

Osteomyelitis either primary or metastatic is a more extensive, serious, and destructive process than abscess but has similar implications. The predisposing factors and specific agents are numerous and interesting but not altogether

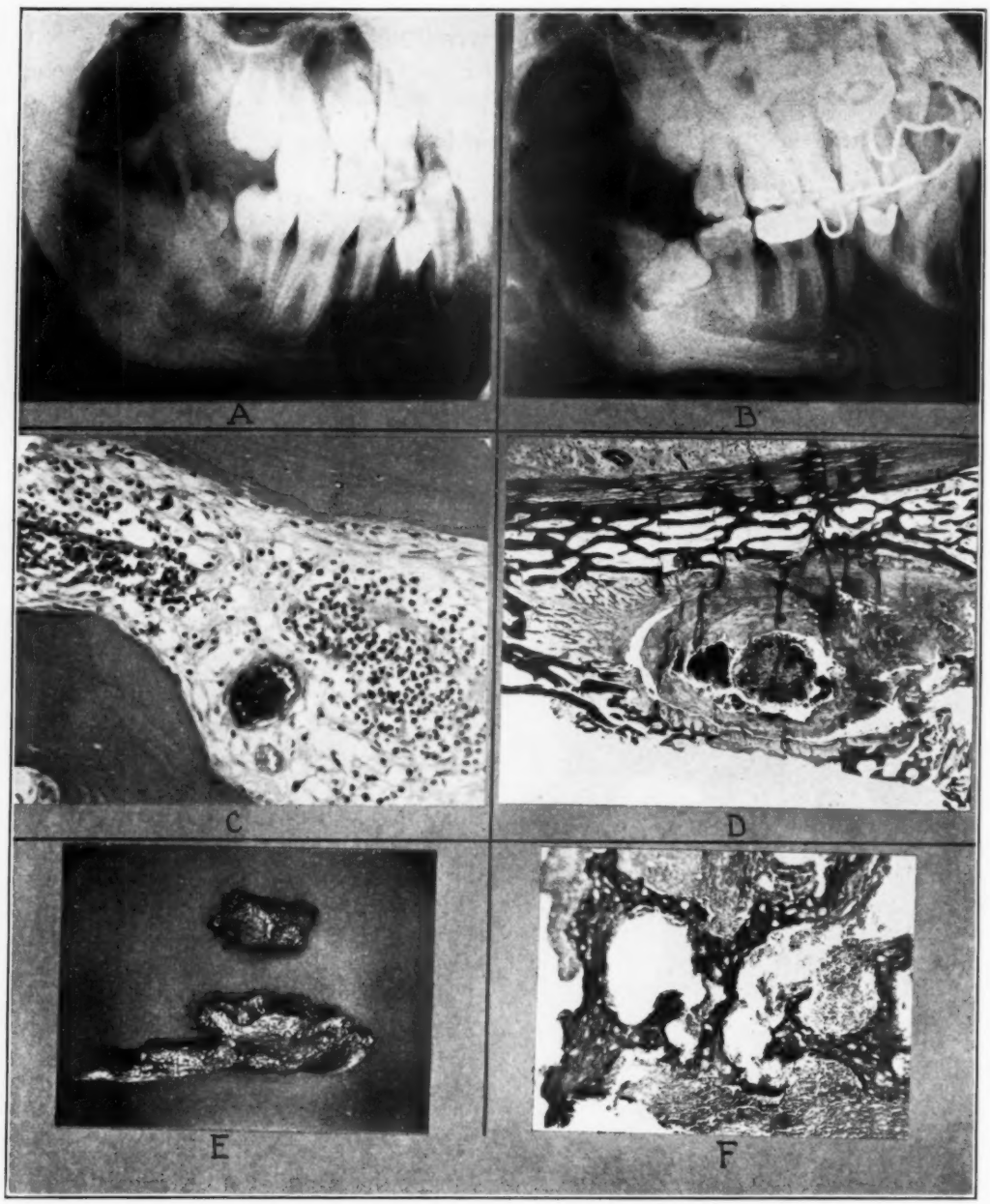


Fig. 17.—Osteomyelitis: *A*, hematogenous osteomyelitis in a young child, with extensive involvement of the mandible; *B*, secondary orthodontic treatment after drainage and removal of sequestra; *C*, early osteomyelitis with hyperemia and purulent exudation; *D*, abscess formation in bone; *E*, sequestra in osteomyelitis in a case of phosphorus necrosis of mandible; *F*, bone necrosis of mandible in radium poisoning.

relevant to the present discussion.[9] Sequestration may have important secondary effects on the further development of the masticatory apparatus, as previously outlined (Fig. 17*E*, *F*). Calcium, phosphorus, and phosphatase are usually

normal for the respective age levels, although the latter may be slightly elevated with marked leucocytosis and extensive lesions.[16]

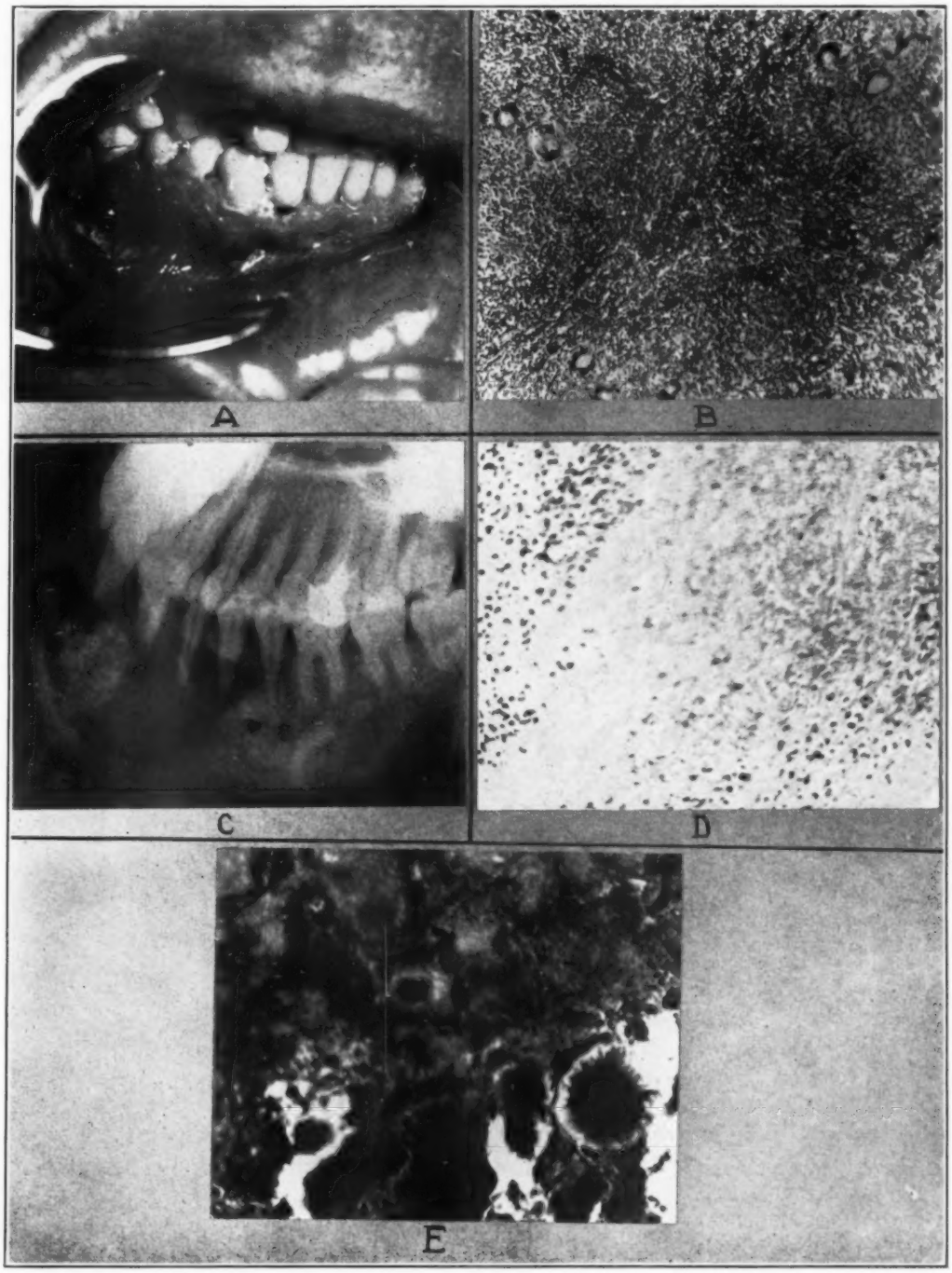


Fig. 18.—Infectious granulomas: *A*, tuberculoma with secondary malposition of teeth; *B*, chronic tuberculous granulomatous inflammation; *C*, syphilitic osteitis; *D*, gumma; *E*, actinomycosis.

Specific granulomatous infectious diseases including tuberculosis, syphilis, and actinomycosis are of sufficient incidence in the oral cavity to warrant at

least mention (Fig. 18). Although the former are more important for their constitutional effects, they may present with oral lesions in which there is real or apparent orthodontic implication. The malformations associated with congenital syphilis are well known and require no special emphasis or recapitulation. Gummas and the periostitis of adult syphilis differ from other rarefying and productive inflammatory processes with respect to etiology and the need for specific constitutional treatment but are otherwise of similar surgical and orthodontic significance.[10]

CYSTS

Radicular odontogenic cysts may originate as complications of dental lesions owing to traumatic occlusion. The factors include caries, pulpitis, gingivitis,

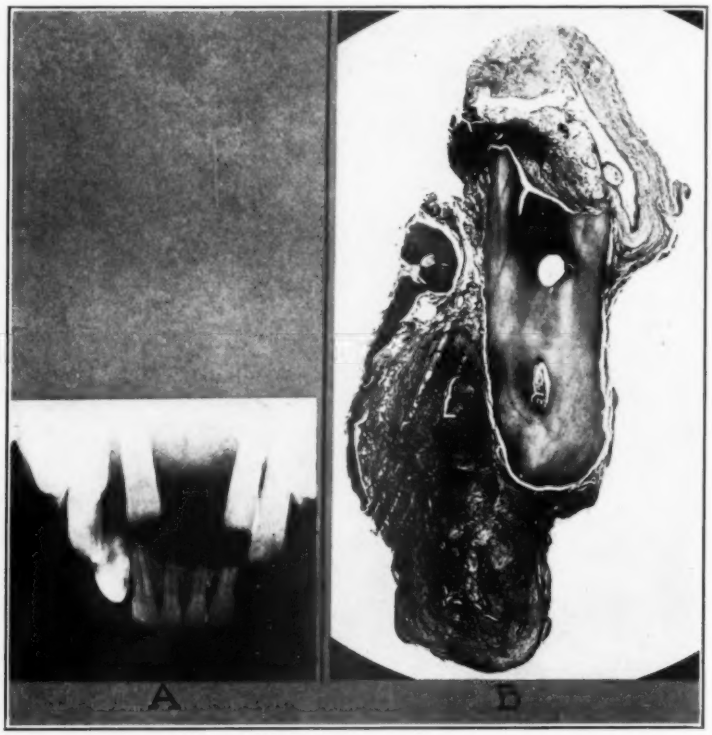


Fig. 19.—Radicular odontogenic cyst: *A*, cyst implicating the incisor teeth of the deciduous dentition; *B*, radicular cyst and epitheliated apical granuloma about retained root.

periodontitis, and the apical granuloma (Fig. 19*B*). When of sufficiently large size the cysts may impair the structural integrity of the attachments of adjacent members of the arch (Fig. 19*A*). Secondary infection and the need for extensive operative intervention are other features that give this common lesion additional orthodontic significance in young subjects. The lining membrane is usually of polyhedral or well-differentiated, stratified, squamous epithelium.[19]

Follicular odontogenic cysts of dentigerous or paradental type are also likely to be the effects as well as the causes of disturbances of the dental apparatus (Fig. 20). They are of more serious pathologic significance because of their relationship to multiple types (Fig. 20*C*), the possibility of recurrence or

the development of other cysts, and ameloblastoma. This is particularly evident in those with atypical epithelium of reticular stellate and ameloblastic characteristics (Fig. 20*B*).[18, 19]

Nasopalatine cysts are of different origin and structure, occur less frequently, and usually do not reach the size of those of odontogenic origin. They occasionally present with symptoms such as mobility or displacement of the

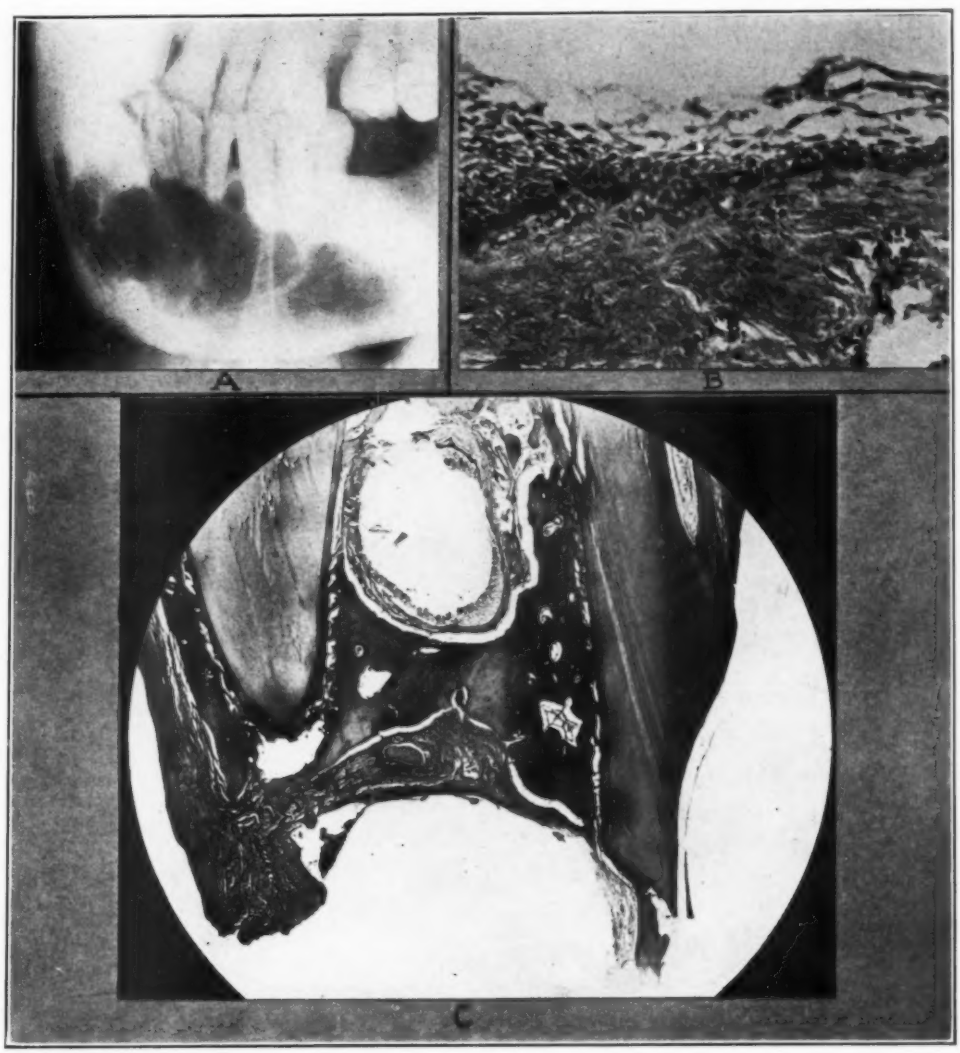


Fig. 20.—Follicular odontogenic cyst: *A*, extensive radicular cyst with small paradental cyst of alveolar process; *B*, cyst wall and membrane of loose textured stratified squamous epithelium; *C*, paradental and radicular odontogenic cysts as shown in roentgenogram in *A*.

incisor teeth (Fig. 21*A*). Their mixed stratified squamous and cuboidal, cylindrical, and ciliated epithelial lining is an expression of their origin in embryonal remnants of the nasopalatine canal (Fig. 21*B*, *C*).[19]

NEOPLASMS

Expanding and infiltrating tumors of benign and malignant types may interfere with the teeth and their attachments and give rise to disturbances in

the arches. Well-advanced cases with these changes have them as merely secondary manifestations incidental to the progress of the disease. In other instances of slow growth with absence of other symptoms the orthodontic aspects may first appear prominent. They may actually become so after surgical intervention or radiotherapy.

Ameloblastoma has been mentioned in connection with the odontogenic cysts because of its potential origin from the epithelium of these structures. This is of sufficiently variable and pleomorphic nature that the ameloblastic

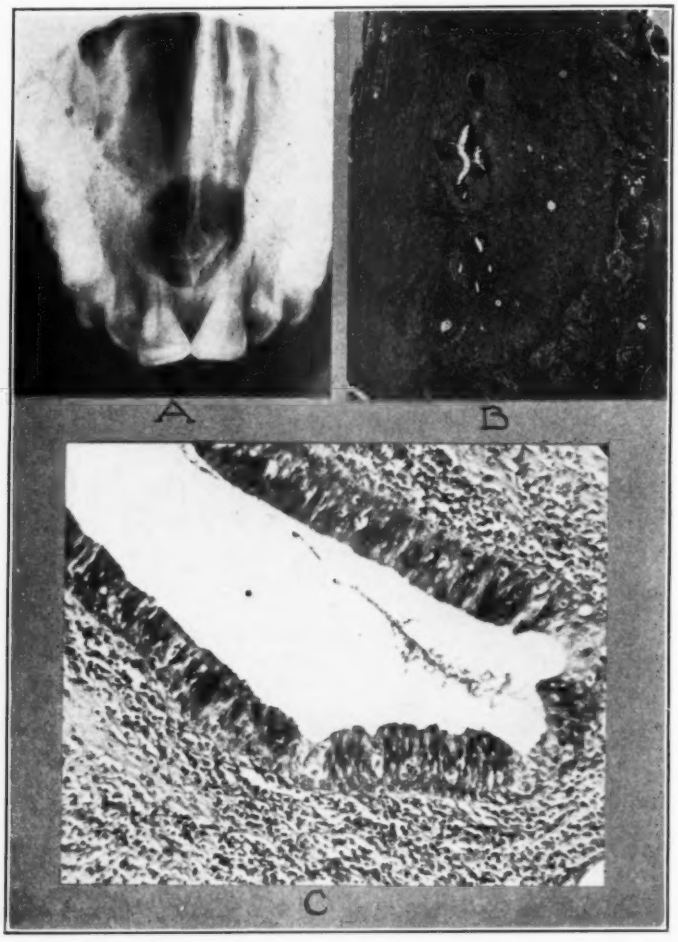


Fig. 21.—Nasopalatine cyst: *A*, midline rarefaction of maxilla with malposition of teeth; *B*, cyst cavity and adjacent islands lined by stratified squamous epithelium and tubules of cylindrical epithelium; *C*, typical lining of ciliated columnar epithelium.

cells responsible for the neoplasm can be present in the membrane as one of the sources of growth. The frequency of occurrence of cuboidal and cylindrical epithelium in follicular sacs is 35 per cent in the class of supernumerary teeth (Fig. 3*B*).[18] Postulation of embryonal reversion of more adult epithelium to less differentiated types and their subsequent prosoplasia is therefore unnecessary, although this is an interesting possibility and may occur in some cases. In other instances the paradental epithelial debris may be activated to neoplastic growth. The proliferation of these elements in the presence of inflammation[49]

A.

Fig. 22.—Ameloblastoma: *A*, multilocular cystic lesion with features of follicular cyst of dentigerous type.

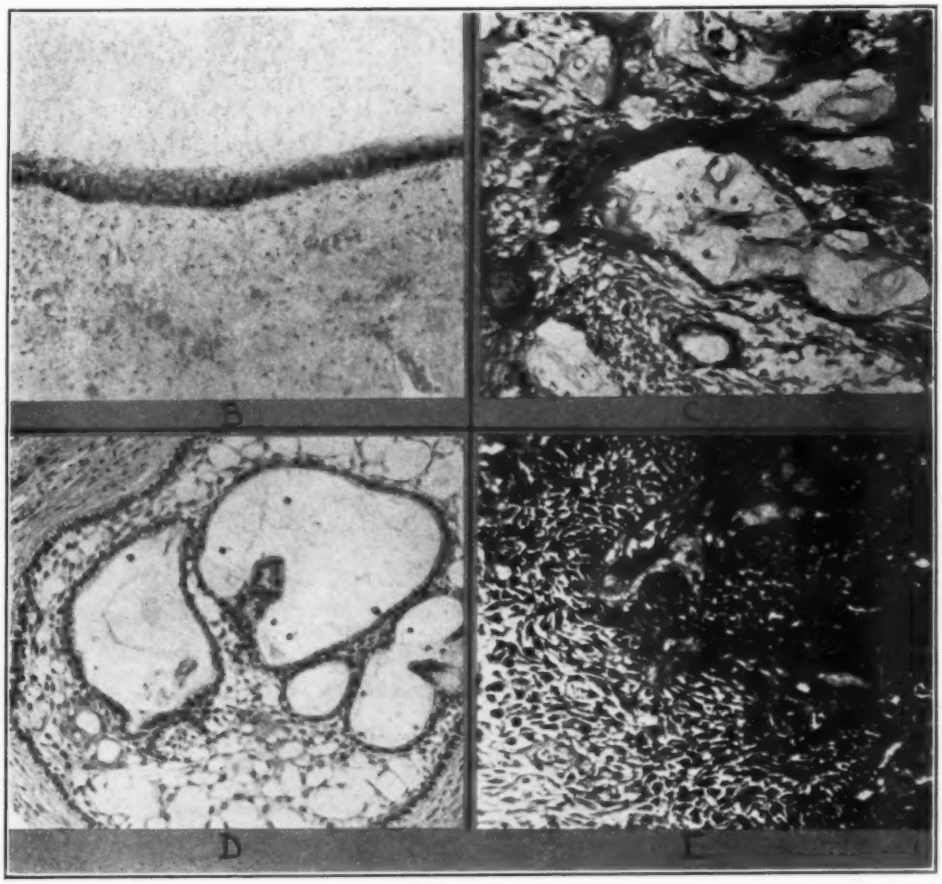


Fig. 22.—Ameloblastoma: *B*, Relatively undifferentiated stratified polyhedral epithelium forming a portion of the cyst wall. This is typical of many cysts of odontogenic type; *C*, Atypical ameloblastoma with microcysts and degeneration from a solid area adjacent to *B*. *D*, Secondary recurrent tumor nodule with classical histology. *E*, Atypical ameloblastoma with features suggestive of ameloblastic carcinoma.

has been known and understood since their description. Data as to ameloblastic trends are not so well established and require further investigation.[19]

In view of the fact that inflammatory processes due to trauma, hemorrhage, and secondary infection may originate in malocclusion, it is not unlikely that the stimulus to neoplasia may occasionally be so initiated. Resorption of bone occurs with the proliferation and infiltration of the ameloblastomatous elements (Fig. 22). Continued growth and cyst formation expand the bone and distort the arch locally and may also have secondary manifestations of orthodontic

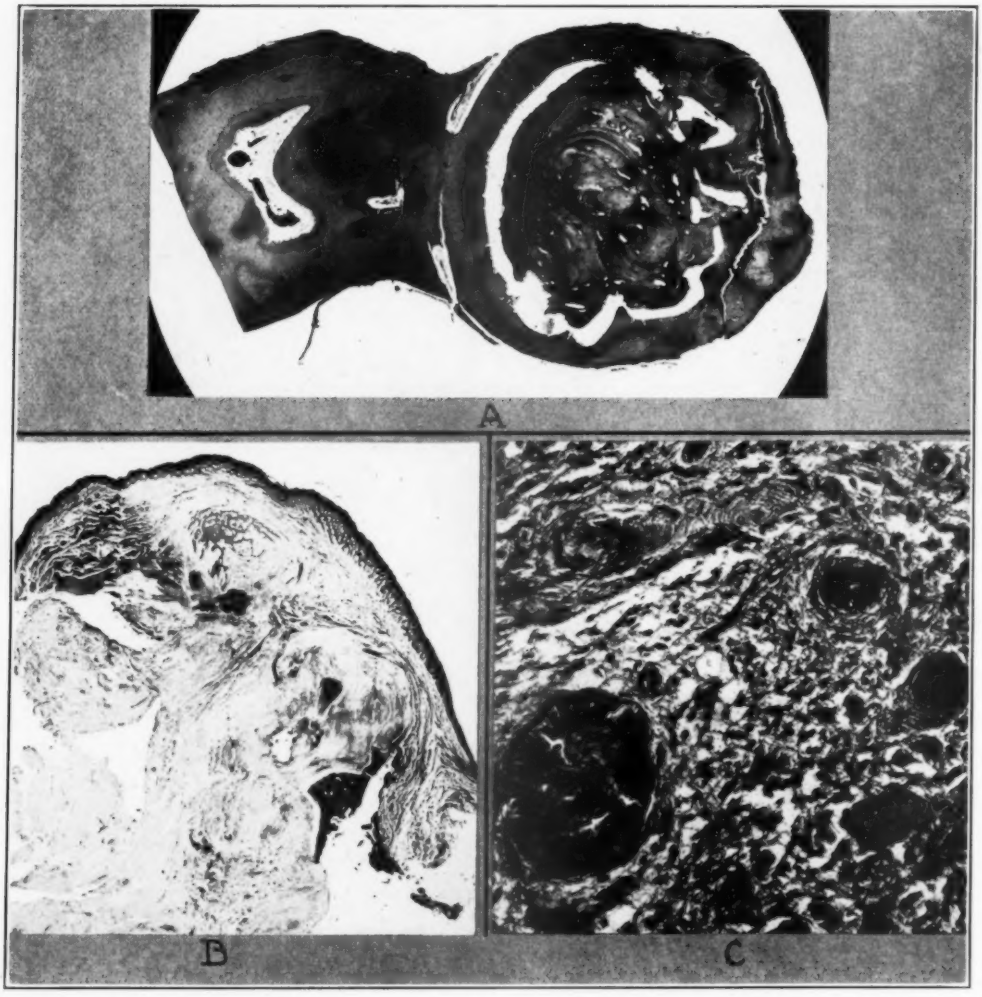


Fig. 23.—Odontoma: *A*, mature geminated composite odontoma; *B*, fibrous odontoma with extensive resorption of alveolar bone; *C*, ameloblastic epithelial island and calcific nodules in fibrous odontoma.

significance in adjacent areas (Fig. 22*A*). Implication of the region of the temporomandibular joint may interfere with mastication. Secondary ameloblastic carcinomatous transformation is of more aggressive type and produces local symptoms and pathologic changes in the adjacent tissues more rapidly (Fig. 22*E*).

The treatment of the disease by surgery, radiotherapy, or their combination is usually sufficiently deforming to require prosthetic rather than orthodontic secondary dental attention.[19]

Odontoma is more likely to proceed in slow initial growth than ameloblastoma because of its more complex organization (Fig. 23). The calcification of its elements makes for less bone infiltration but results in a more rigid mass. The direct pressure is therefore pronounced and has a greater potential distorting effect (Fig. 23*A*). Incomplete dentition in the affected area is another factor.

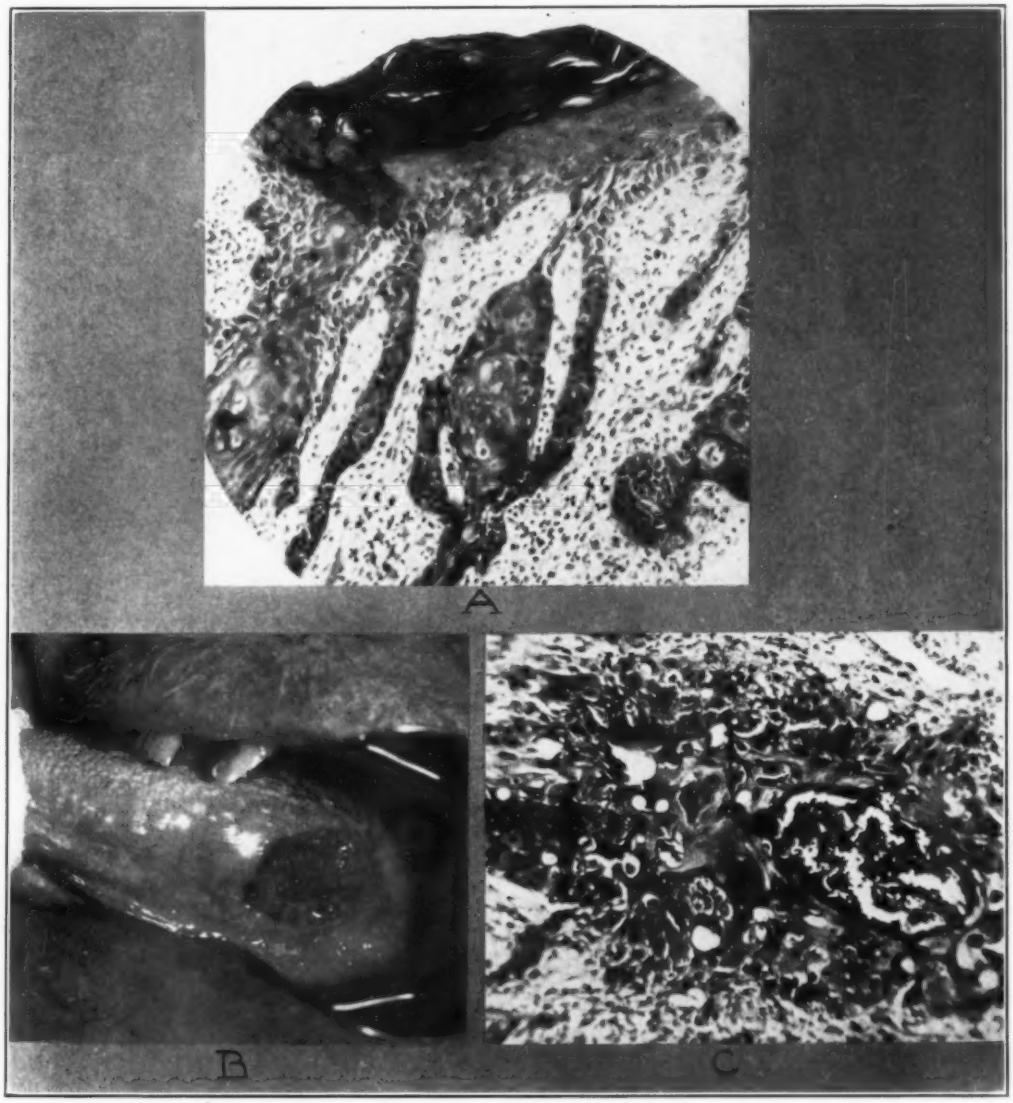
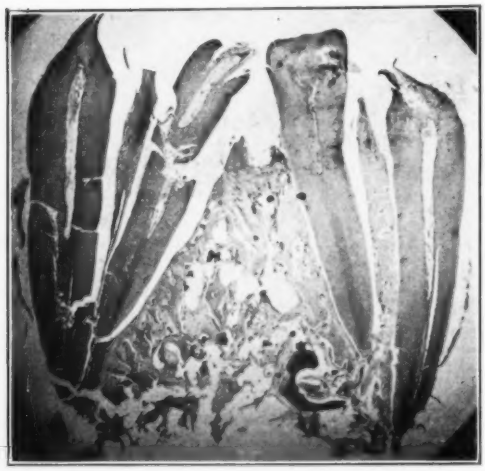


Fig. 24.—Epithelial lesions: *A*, leucoplakia with atypical acanthosis; *B* and *C*, squamous cell epidermoid carcinoma.

The immature types with preponderance of fibrous elements (Fig. 23*B*) have potentialities for sarcomatous change, following which rapid growth, expansion, and bone destruction become accelerated. Epithelial components (Fig. 23*C*) may undergo similar malignant transformation in which they have the features already identified with ameloblastic carcinoma.[19]



A.

Fig. 25.—Mesoblastic neoplasms: *A*, hemangioma with resorption of alveolar bone and secondary malposition of teeth.

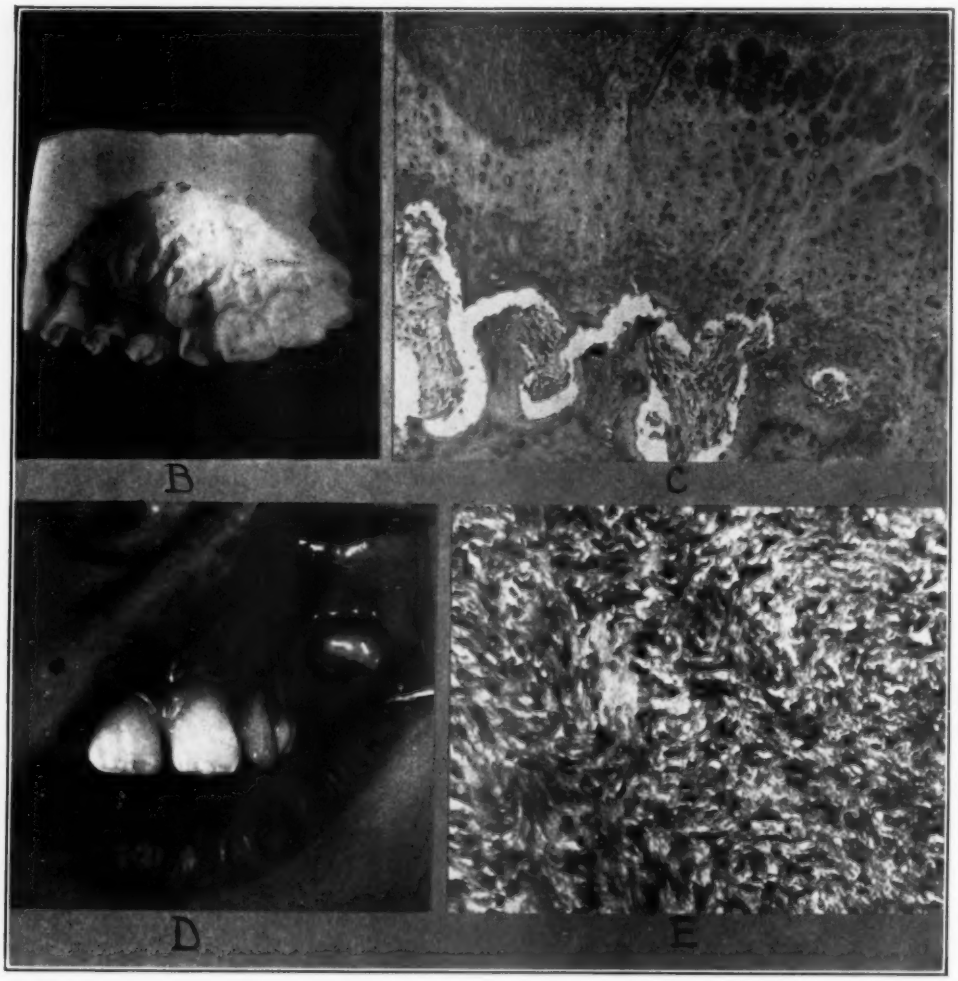


Fig. 25.—Mesoblastic neoplasm: *B*, Neoplasm replacing papilla and displacing lateral incisor; *C*, chondroma; *D*, papillomatous nodule interfering with mastication; *E*, cellular fibroma.

Surgery, particularly with the excision of large tumors and the sacrifice of adjacent bone and teeth, may produce further disturbances in the arches. Orthodontic measures following such intervention may be required in children and young adults.

Mixed tumors of salivary gland type are occasionally of aberrant location in the retromolar space, fauces, and palate. Their clinical diagnosis is uncertain but does not ordinarily include orthodontic problems even though such evidence may be present as a complication.[19]

Epithelial neoplasms other than those already considered are usually more obvious because of their evidence on inspection. Under such circumstances it is not likely that any secondary manifestations of orthodontic character be confusing. Various types of papilloma and epidermoid carcinoma occurring in the

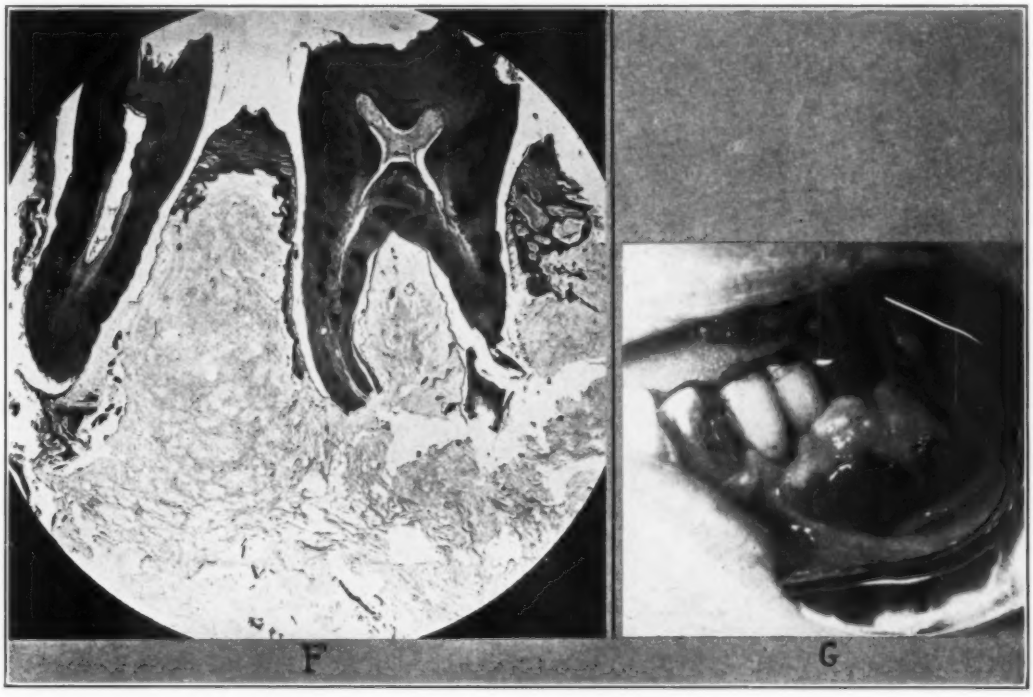


Fig. 25.—Mesoblastic neoplasm: *F*, Myxoma with extensive resorption of alveolar bone; *G*, osteofibroma with tumefaction and malposition of teeth.

oral cavity may be included in this connection. Their diagnosis and treatment are usually the functions of oral pathology and surgery. Carcinoma with metastasis to the jaw is rare.[19]

The well-established relationship of dental trauma in the etiology of papilloma and fibroma, particularly in the common hypertrophies affecting the oral mucous membranes, has orthodontic significance, however. Leucokeratoses and the leucoplakia that follows them are of more serious consequence because of their potential carcinomatous transformations.[19] It is through prophylactic measures designed to prevent such injuries and their sequelae that the orthodontist may offer a valuable service (Fig. 24).

Mesoblastic neoplasms are not evident on inspection until tumefaction has been produced or unless attention is directed to them through secondary mani-

festations (Fig. 25). As in other diseases involving the jaws, this may be effected in the course of growth through structural deficiency with resorption of bone and changes in dental alignment. The roentgenographic features of this heterogeneous group of lesions are not specific, and their diagnosis may require biopsy. Angioma (Fig. 25*A*), lipoma, chondroma (Fig. 25*B, C*), fibroma (Fig. 25*D, E*), myxoma (Fig. 25*F*), and their combinations are representative

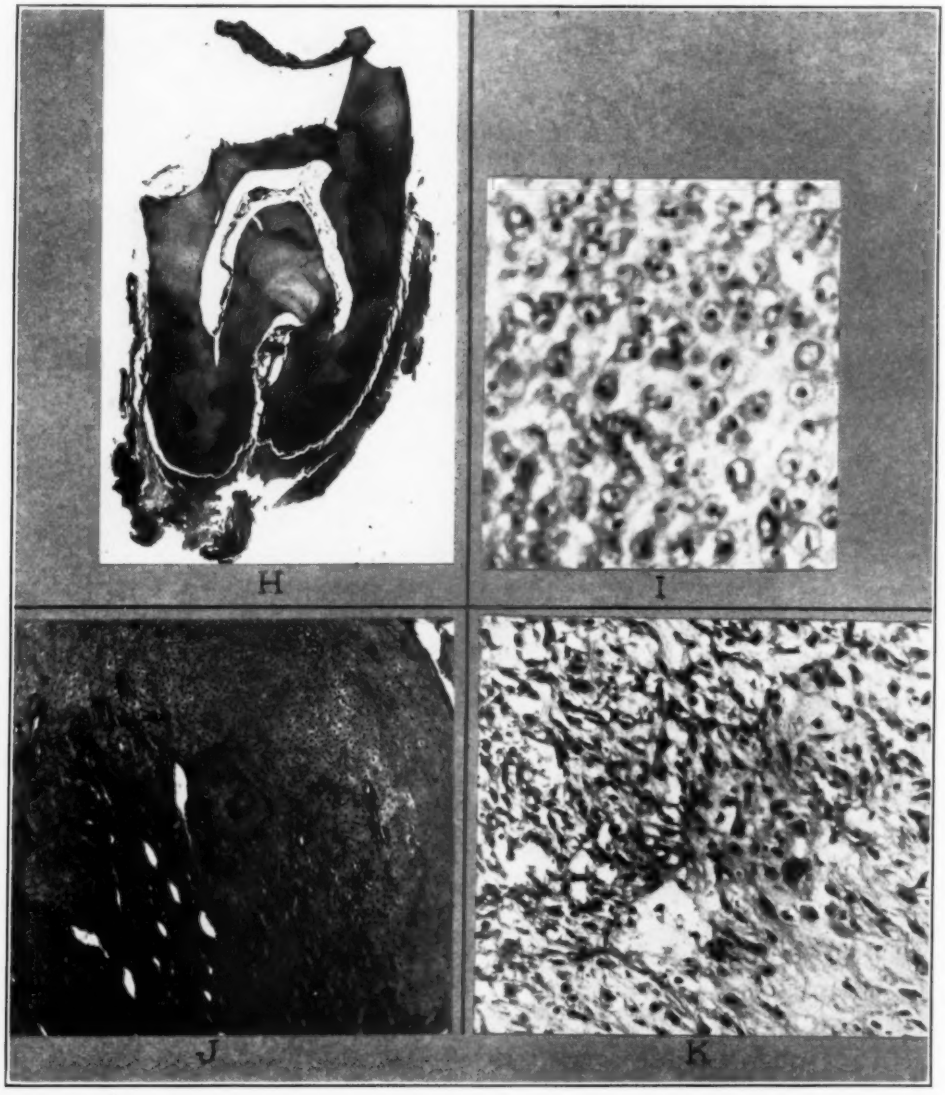


Fig. 25.—Mesoblastic neoplasm: *H*, Lymphosarcoma invading and replacing periodontium and associated clinically with elevation of the molar and malocclusion; *I*, reticulum cell lymphosarcoma; *J*, chondrofibrosarcoma; *K*, osteogenic sarcoma.

types. The osteoma has more definite roentgenographic characteristics than the other neoplasms and, like the odontoma, produces considerable local deformity but may resemble the hyperostotic dystrophies and require special clinical investigation before surgery (Fig. 25*G*).[16, 19]

Sarcomas (Fig. 25*H, I, J, K*) are frequently more confusing in their clinical setting than the benign mesoblastic neoplasms. Their tendency to rapid growth

with more extensive involvement of adjacent tissues, secondary infection, and hemorrhage usually predominates over any consideration of their effects on the arches, even when these are marked. Yet sclerosing forms of osteogenic sarcoma of relatively slow ingravescence, producing constitutional symptoms of leucocytosis and elevation of the temperature, may be associated with displaced teeth, mistaken for osteomyelitis[19] and attributed to malocclusion. This is also true of endothelial myeloma. Both these malignant neoplasms may involve the jaws and are not unusual in young subjects. Their prognosis is unfavorable at best, but depends on the careful evaluation of any presenting symptom and early diagnosis.

SUMMARY AND CONCLUSIONS

A consideration of representative lesions affecting the oral cavity and masticatory apparatus has been presented with the intention of correlating them both as primary and as secondary mechanisms.

Developmental anomalies of hereditary and familial type have been confined largely to those associated with fairly well-defined pathologic tissue variations. This relatively small but instructive group was emphasized because it illustrated fundamental changes producing malocclusion through structural, growth and tissue effects.

Trauma was considered with respect to its etiologic factors, complications, and sequelae, as both a cause and an effect of disturbances in the arches.

Dental aspects of oral pathology and the relationship of the units to the integrated system were demonstrated.

Endocrine disturbances affecting growth, development, and differentiation with particular reference to the teeth and jaws were restricted to those proved by well-authenticated evidence based on pathologic, physiologic, and clinical research.

Nutritional and metabolic derangements were similarly defined. Calcium, phosphorus, and phosphatase were mentioned in particular instances to substantiate the reliability of interpretations supported by physiological chemistry.

Other dystrophies of idiopathic etiology but with orthodontic significance were presented because of their frequent association with constitutional disorders of which the oral manifestations were secondary but occasionally revealing.

Inflammation and infection were particularly emphasized because their operation was indicative of causative and sequential processes in both oral pathology and orthodontics.

Cystic lesions were described with the intention of relating their initiating stimuli to orthodontic problems. Their pathologic significance and their histogenesis were illustrated on this basis, although orthodontic sequelae were also discussed.

Neoplastic disease of various types was considered, more particularly with respect to its effects on the arches. The prophylactic value of orthodontic control of lesions predisposing to benign and malignant tumors was emphasized.

The progress of orthodontics depends in a large measure on advancing the ability to coordinate its theory and practice with a broader understanding and appreciation of oral pathology.

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101 EAST SEVENTY-NINTH STREET

PHYSIOLOGICAL ASPECT OF BONE AND MUSCLE AS APPLIED IN MUSCLE TRAINING IN ORTHODONTICS

OSCAR I. CIVEN, D.M.D., DORCHESTER, MASS.

FUNCTION as a developmental process plays a very important part in the organic world.

Conklin[1] states regarding function: "Functional activity is a factor in development. Normal development is dependent on correlated activities of any part of the organism. If any of the stimuli and responses are lacking, the development of that part is arrested or inhibited."

In treatment of orthodontic cases we come across underdeveloped mandibles or maxillae, due to lack of function. In order to establish the normal function, we have to establish the teeth in functional occlusion. This functional occlusion is not sufficient to obtain permanent results. We have to reconstruct the bones that support the teeth.

But bone alone we cannot reconstruct unless we resort to the forces—muscles—that shape the bones in the body. We must resort to muscle training.

In resorting to any muscle training we must have a very clear understanding of physiology of bone tissue and *muscle tissue* in the human body.

In England there have been quite a number of experimenters on bone and muscle physiology. The most outstanding were Keith, Andy, and Wolff.

Keith[2] states: "Muscles are most delicate and highly organized tissues in the body, and to move them successfully, great judgment and patience is required. Every bone in the body is shaped so as to serve the required function in its situation. If it becomes displaced in its relationship to the bones even to a slight degree, its living osteoblasts at once commence to remodel and adapt it to serve its function under altered conditions.

"Every fiber of muscle is arranged according to the normal line of action of muscles. Then every fiber of that muscle has to undergo readjustment to answer the new condition at work; the more we alter the line of action, the greater burden we throw on the power of adaptation which is inherent in every muscle."

Keith recognized the inherent power of bone to repair and adjust to new surroundings. But inherent power in the bone is stimulated by the action of the muscles that are attached to it.

Andy, in *Menders of the Maimed*, came to the same conclusion regarding the physiology of bone and muscle. In this same book, Andy states: "The living body is shaped by its muscles; that if we would have our children to grow up with straight and well-formed bodies, so we must see that they have proper exercise; if the body becomes deformed, a proper use of muscle will remove deformity."

For him the body of a boy or a girl is a plastic thing. By properly ordered exercise, deformities can be prevented and cured.

Of all the three above-mentioned experimenters, I may state that perhaps Wolff is the greatest. Through his innumerable experiments on bone and muscle, he devised the famous Wolff law on physiology of bone.

"If a normal bone is used in a new way, its structure and form will change to meet a new function. Every change in the form and function of a bone or the function alone is followed by a certain definite method in their normal architecture and equally definite to secondary alteration in accordance with the mathematical law."

Wolff said, "For any deformity in the bone we should look for a primary cause in muscles."

In treatment of all deformities of bone, Wolff based it on the principle of response which living bone makes when submitted to pressure. He regarded the living bone as a sensitive plastic tissue controlled by lines of forces transmitted by the framework of a limb, the bones retaining their normal axis of limb and their normal form and architecture.

Rogers applied the researches of Conklin, Keith, Andy, and Wolff to muscle training in orthodontics. He believed that all harmonious and unharmonious development of the facial muscles is due to some dysfunction in the masticatory apparatus. In one of his articles,[3] he says: "Structural alterations are not the result of any variation in mechanical laws as they effect the development of bone, but are the natural sequence of a disturbance in normal function in its relationship to the various tissues, whereby the mechanical laws are caused to work habitually in an abnormal exceptional manner.

"These laws are immutable, it is the manner of use that changes the structural modifications."

Also in another article[4] he states: "The normal application of forces affecting developing bone results in normal development of the form of bone.

"Abnormal application of forces to the bone in adult life will also change and modify the shape and character of bone tissue."

Because of malocclusion of teeth there is always a change in the controlling forces of the muscles of the masticatory apparatus and, as a result, a change in the structure of the bone surrounding the teeth.

Rogers was the first to recognize this phenomenon as far as the masticatory apparatus is concerned. He is the first one in the United States to advocate muscle training in orthodontics. He says:[5] "It avails us little if we diligently seek to place one part of the human machine in harmonious relation and neglect that other part upon which permanent success depends.

"The principle of muscular balance and mechanical advantage in the complete organism, including special guidance and control of these in the particular weakness upon which the attention would be directed, urging them on their normal development and strength until harmoniously developed face completes the restoration of the organism to its normal inheritance."

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1077A BLUE HILL AVENUE

THIRTY-SIXTH ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF ORTHODONTISTS

Business Sessions

THE business sessions of the Thirty-Sixth Annual Meeting of the American Association of Orthodontists were held July 12, 13, and 14, 1938, at the Hollywood-Roosevelt Hotel, Hollywood, Calif. Dr. James D. McCoy, president, presided. The Association accepted the invitation of President-Elect Harry A. Allshouse, Jr., to hold the 1939 meeting in Kansas City, Mo.

Report of the Board of Censors

Dr. Harry A. Allshouse, Jr., Kansas City, Mo.—The Board of Censors would like to recommend for your approval the following names:

Dr. C. Edward Martinek, Detroit, Mich.
Dr. C. M. Musser, Fairmont, W. Va.
Dr. William G. Sheffer, San Jose, Calif.
Dr. Albert Reginald Winn, Montreal, Canada
Dr. P. M. Dunn, Minneapolis, Minn.
Dr. Fairman W. Fahrney, Glendale, Calif.
Dr. William James Armstrong, Los Angeles, Calif.
Dr. Thomas Speidel, Iowa City, Iowa
Dr. Charles M. Alderson, Los Angeles, Calif.
Dr. Edith Hilda Bill, Baltimore, Md.
Dr. J. Elliott Dunn, Oakland, Calif.
Dr. Holly Halderson, Toronto, Canada
Dr. Meyer Eggnatz, Baltimore, Md.
Dr. Rolland C. Billeter, Battle Creek, Mich.
Dr. Henry Cossitt, Toledo, Ohio
Dr. Frederick T. Barich, Evanston, Ill.
Dr. Reuben E. Olson, Wichita, Kan.
Dr. Harold H. Bjornstrom, San Francisco, Calif.
Dr. William M. Jarrett, Charleston, W. Va.
Dr. J. Wilfred Harrison, Detroit, Mich.
Dr. Louis E. Broverman, Wheeling, W. Va.
Dr. George H. Siersma, Denver, Colo.
Dr. Charles Merrell Waldo, Denver, Colo.
Dr. Jesse A. Linn, Los Angeles, Calif.
Dr. Richard C. Beatty, Cleveland, Ohio
Dr. Reuben Lloyd Blake, San Francisco, Calif.
Dr. Cecil G. Muller, Omaha, Neb.
Dr. George C. Chuck, Long Beach, Calif.

These names have been passed by the Board of Censors.

The report was approved, and the names were accepted for membership.

Report of the Secretary

July 1, 1938

Active members—January 1, 1938	412
Active members from sectional societies	60
Active members accepted July 11, 1938	28
Total active members, July 11, 1938	500
Honorary members	7
Service members	6
Total	513
Members dropped for nonpayment of dues	0
Members resigned	3
Members owing dues for 1937 as of Auditor's report, January 12, 1938	0
Members owing dues for 1938 as of July 1, 1938	0

CLAUDE R. WOOD, Secretary

Report of Treasurer

Summary of Cash Receipts and Disbursements

January 1, 1937, to December 31, 1937

Balance on hand Jan. 1, 1937		$ 2,240.35
Cash received from following sources:		
Dues 1935	$ 10.00	
Dues 1936	170.00	
Dues 1937	4,070.28	
Application fees	800.00	
Registered guests—1937 meeting	700.00	
Refund local arrangements—1937 meeting	9.87	
Interest on U. S. Treasurer Bonds	143.75	
Interest on Savings Account	75.26	
Total receipts		$ 5,979.16
Total received and on hand		$ 8,219.51
Cash disbursements as follows:		
Honorarium—Secretary-Treasurer, C. R. Wood	$ 500.00	
Audit of books	30.00	
Badges	42.91	
President's expenses	87.49	
Executive committee	82.71	
Application fees refunded	75.00	
Registration fees refunded	10.00	
Bond	50.00	
Reporting	380.40	
Floral offering expense	11.89	
Bank exchange	4.83	
Essayists—1937 meeting	118.60	
Local arrangements—1937 meeting (less refund)	500.00	
Program Committee	20.00	
Socio-Economic Committee	66.54	
Educational Committee	6.60	
Librarian	5.00	
Clinic expenses	123.91	
Secretarial registration—Chicago Meeting	35.00	
Express and transfer services—Chicago Meeting	22.50	
Incidentals—Chicago Meeting	30.00	
Printing	764.44	
Cash for stamps and mimeographing	135.86	
Total disbursements		$ 3,103.68
Balance on hand Dec. 31, 1937		$ 5,115.83

CLAUDE R. WOOD, Treasurer

RECONCILIATION OF ACCOUNT WITH PARK NATIONAL BANK, KNOXVILLE, TENN.

December 31, 1937

Balance per bank statement, Dec. 31, 1937		$ 5,020.57
Add: Deposit in transit, Dec. 31, 1937		95.26
		$ 5,115.83
Less: Outstanding checks		000.00
Balance per books, Dec. 31, 1937 (as per Auditor's Report)		$ 5,115.83

FIRST NATIONAL BANK, CHICAGO, ILL.

SAVINGS ACCOUNT

Balance per Pass Book No. 1,030,348, Dec. 31, 1937	$ 5,000.00

SCHEDULE OF UNITED STATES GOVERNMENT BONDS

December 31, 1937

United States 2 7/8% Treasury Bonds of 1955-60

Numbers	*Par Value*	*Cost*
155394-D	$1,000.00	$ 995.03
155395-E	1,000.00	995.03
155396-F	1,000.00	995.03
155397-H	1,000.00	995.03
155398-J	1,000.00	995.03
Total	$5,000.00	$4,975.15

SUMMARY OF ASSETS

Dec. 31, 1937

Park National Bank, Knoxville, Tenn., Checking Account	$ 5,115.83	
First National Bank, Chicago, Ill., Savings Account	5,000.00	
United States Government Bonds	5,000.00	
East Tennessee National Bank, Knoxville, Tenn. (Closed)	464.39	
Total Assets December 31, 1937		$15,580.22
Total Assets December 31, 1936		12,874.74
Increase During Period		$ 2,705.48

CLAUDE R. WOOD, Treasurer

Report of the Election Committee

Secretary-Treasurer Wood.—Result of the balloting is as follows:

President-elect	Dr. W. A. Murray, Evanston, Ill.
Vice-president	Dr. Harry Hosmer, Detroit, Mich.
Secretary-treasurer	Dr. Claude R. Wood, Knoxville, Tenn.
Librarian	Dr. Abram Hoffman, Chicago, Ill.

President McCoy.—It is with a great deal of pleasure that I present Dr. R. B. von KleinSmid, of Los Angeles, president of the University of Southern California, who will deliver the address of welcome.

Address of Welcome

Dr. R. B. von KleinSmid.—It is a distinct pleasure to welcome the best organization, meeting in the Roosevelt Hotel on the morning of July 12, to the other best city in the world —I include the world because I have just had the pleasure of meeting a gentleman from London—in the other best state in the Union, in the other best climate in the other best state, and the very best hospitality that you will experience in southern California during the term of your meeting.

In other words, I should like to dispose of climate, of hospitality, and of any controversial questions that might arise in comparisons, at once, and leave you all entirely satisfied; not only completely satisfied for the moment, but satisfied in anticipation because, after all, you meet here in southern California a very modest people, slow in expression, although not slow in appreciation of the blessings of this other Garden of Eden. In fact, you cannot go any place where you can take climate so completely for granted as you can in southern California. I doubt if you could hold your meeting in any spot in the world in which you could rest so entirely easily with reference to hospitality.

With that introduction of the very modest conception of the place to which we have come and the people among whom we have come, let me again assure you that you are most welcome.

The American Association of Orthodontists is one of a sisterhood of societies which must feel in these days a very heavy responsibility. It is not my function nor my pleasure, Mr. President, to dwell too heavily upon the seriousness of the conditions under which we all live and work these days, but personally I feel so deeply the responsibility of educated and trained men, with reference to the affairs of the world, that I should fall short of performing the duty, which is a duty, did I not call attention to the fact that the American Association is one of a sisterhood of learned societies in the United States of America. You have earned the right to your membership not only by training and experience, but by delivery of that which was expected of you.

Membership in this Association, I understand, is not merely a badge of professional attainment; it is a badge of professional achievement in the field of education and in the field of service. Because that is true, I feel that, while your program will be very largely devoted to the practical affairs of your particular profession, you, with other organizations, will give some attention at least to the responsibilities which rest heavily upon the shoulders of all well trained and thoroughly educated men in the United States of America at this time.

First, you are educated in dental education. Education in no specific field in these days feels itself, as it were, at rest. It has come along the way of a hard road. That is true, certainly, of medical education. From the day when a few practitioners gathered about themselves in Bologna a group of young people who looked forward to the privilege of medical service and merely told them by word of mouth the things they themselves had learned to the present day in the field of medicine, the struggle has been hard, and at the present moment there probably face that profession more serious fundamental problems than at any time during the history of medical practice.

But I do not think that profession stands alone at all in this respect. Dental education is in exactly the same mold. There have never been so serious and so fundamental problems facing us in dental education as at the present moment.

Just what constitutes, after all, the basic and necessary education in preparation for dental practice? I, for one, should be willing to admit at the outset that nobody knows. There are a few quarters in the United States of America—I do not observe them to be so numerous in other parts of the world—where arises a prophet who seems to know all about what education ought to be. There is one, for instance, who defines a college and then compares those institutions in the United States which in the present day go under the name of college, and says, "Because they do not fit my specifications, they are not colleges."

There arose one among us who professed to know just exactly what constituted a university. He was not quite satisfied to examine the universities in the United States agreeable to these specifications, but he carried those into England, went across the channel and brought in one or two from France, introduced a university from Germany and one from Italy, and said, "Since the United States of America has no institutions which fit my specifications; since England has only one, since France has none, and since Germany has only one, therefore the number of universities in this great world of ours are very, very few." So he proposed to start a new university agreeable to his definition.

But in professional education, so far as the United States of America is concerned, I think we are determined that we do not know what constitutes necessary, fundamental, basic and methodological contents of dental education. Oh, we know as well as anybody knows, that is true, but we are dealing, after all, with a human equation, and the human equation up to the present time has refused to divulge just the things which he needs in order to make him the most efficient servant in his day and generation through the medical profession.

I leave it to you, it would be no fun to prepare for a profession, the concomitants and conditions of which were cut and dried and universally known. But that we have made progress on some other basis than the trial-and-error basis is proof enough that it lies within the ability of our various professional groups to discover some of the basic principles. Some have already been discovered, some of defensible methodology; some have been discovered and some have been used.

But we go beyond that. It is an interesting thing that with all of our boasted universal and compulsory education in the United States of America, comparatively few of us

have had even college training, let alone professional training. Professional training has moved very rapidly and over a long area and wide, during a single generation.

I am thinking back to those days when in this country a man proceeding up and down the street every day was known as doctor, and, being a member of a family in which a young man wished to become a physician, I inquired one day where the doctor had received his education and how long it took him to prepare. I found he had attended one of the best medical schools in the country, and he had been a registered student for two months. I lived through that period of time in which it would have been necessary for him to have attended at least two years, and a little later four years, and now to have been probably a college graduate before he entered upon his professional studies; if not that, at least a student of three years' college experience.

I lived in a state in which it was thought that you reflected against the ability and the honor, indeed, of Abraham Lincoln if you required anyone to attend a law school before he practiced law. You could read a few weeks in the office of a lawyer if you had the opportunity. If, indeed, that opportunity was not afforded, all you had to do was to bring a reputable citizen before the court who would swear that you, yourself, in turn, were a man of good repute and you could be admitted to the bar. From that day to this, hand in hand with other learned professions, law has required high school education, two years of college, three years of college, four years of college, and three years of professional training.

I do not know what could have constituted proper preparation for dentistry in those days. I only know I was the subject for dental practice where occasionally the wrong tooth was drawn and where, if the fillings lasted during the course of an ordinary summer's vacation, I was considered very lucky. Now we are asking for college training, at least two years of it, and we are asking for three, four, or five years, dependent upon the particular camp in which you rest at the present moment, of professional training.

But there is something beyond this. Not only are we a small group so far as professions are concerned and, therefore, must carry the burden of professional service in the United States of America; we are a small group so far as educated men and women of the United States are concerned. Time was, only a decade ago, when going down the street you would pass 100 men before you would find another one who had attended college and received his degree. Now, after all of the hustle and bustle, during which time we have achieved thirty million elementary students in our primary schools, and we have attained the number of four million in secondary education, practically as many in college education, and as many as high school and college combined in what we call extension work or continued education, for everybody is doing it these days; in spite of that fact, you may go down the street and you can meet only fifty persons before you will meet another college graduate, and two out of 100 of us—it is not a holier-than-thou attitude—it is recognition of responsibility and privilege. We confer degrees these days with all the honors, with all the rights, with all the privileges, but, in addition, with all the duties and all the responsibilities of an educated citizenship in the country to which we belong.

You are not unaware, good friends, that the first responsibility which rests upon your shoulders today is not necessarily the responsibility of discharging the obligations of your profession; it is discharging the obligations of your citizenship. You discharge them in part through your profession, that is true, but that does not discharge them in their entirety at all.

There are abroad in these lands those sinister influences which would make it impossible even for you to practice your profession as a progressive student of the science upon which that profession is based. When we come to move toward the totalitarian state, what are the first things which are liquidated? You know. The church. You may say, "All right; we may find a substitute for the church." I doubt it. The world would have been very tardy in its progress except for the influence of the church. Next, the school. And those influences which liquidate the school likewise liquidate the home.

Observe closely, if you will, what is happening in the authoritarian sovereign state, and you will find it is undermining the very spirit which makes for progressive science, the very spirit which makes for social and cultural advancement.

Now that is your responsibility. You will not discharge it in full, of course, in this convention, but I beg of you, if you remember no other thing I am saying this morning, with the kind privilege accorded me in this important assembly, remember this: Discharging the responsibilities of your profession only in part discharges the responsibilities of your citizenship. They are heavy, and they grow heavier.

Let us go back home with the sense of sovereignty in citizenship. Oh, it is true that occasionally one has arisen in history who has had a perfect right to say, "The state! Liquidate. I am the state," until we came to the period of democracies. When we came into democracies, every citizen had a right to say, "I am the state." That is the responsibility of citizenship in this country or any other country that exalts democracy. It is not the form of democracy; it is the spirit of government. That spirit of government lies in the privilege of exercising opportunity, and that opportunity is the opportunity of spiritual and cultural progress which makes ultimately for professional success.

Response to Address of Welcome

Dr. William A. Murray.—I believe the Program Committee, the Local Arrangements Committee, and everyone who has had any part in creating this meeting, can feel gratified that so many men have come such long distances to attend it.

We are very, very fortunate that we can participate in and accept this spirit of hospitality that has been extended in the welcoming address of Dr. von KleinSmid. We are glad to be here; we are going to enjoy this best city, best state, and best climate to the fullest extent.

I think we are very grateful to Dr. von KleinSmid for his very timely and educational discourse, along with the very gracious welcome we have received from him.

Dr. McCoy's address, which followed, is found on page 1115 of this JOURNAL.

Dr. George A. Barker read the report of the Socio-Economic and Legislation Committees, as prepared by the chairman, *Dr. T. W. Sorrels*, who was not present. This report was published in the September, 1938, number of the JOURNAL, page 855.

Report of Public Relations Committee

Dr. Homer B. Robinson, Hutchinson, Kan.—I might state this is about the first opportunity I have had to be in this room today. Handling the publicity of an organization of this sort is tremendous. I have worked all the time. In my recommendation I am not inferring that this has not been handled here. Mr. Addison is very capable and has been a publicity man for years, but he is too busy to help me a great deal, and it has been a tremendous task.

As chairman of the Public Relations Committee, I wish at this time to especially thank the other members of this committee, Dr. H. C. Pollock, St. Louis, and Dr. Frank Nicolai, Brooklyn, New York, for their splendid cooperation on all occasions. And I also want to say how much I regret that Dr. Nicolai cannot be present at this meeting.

Under the circumstances, we have done all that is possible for dignified publicity for the Association. We feel that the only successful way to handle the publicity for a meeting is to secure the services of a publicity agency; first, because the committee is not familiar with the newspapers of other cities; second, because these agencies have our work and our interests at heart; third, because they know the publicity game and they know what the layman wants.

There are a lot of phases to this work that those who have not worked with it do not understand. One has to be a diplomat in order to satisfy each of the different authors. If one newspaper feels you have favored another, it quits. And after about a dozen years of experience, I am just beginning to learn something about publicity.

It is well known that there is a growing demand from the people for more knowledge along various lines, and they are going to secure that knowledge if at all possible. And surely it is better that we give them information as nearly correct as possible, rather than leave it to those who have no basic knowledge of the facts.

Personally, I cannot see why anyone would object to enlightening the public in regard to orthodontics. If we are ashamed of our results, we have a basis for such objections; but, since we are rendering one of the greatest services to humanity, I feel that the public should know something about it. We therefore heartily approve the Public Relations Plan for the American Association of Orthodontists, as recommended by the New York Society of Orthodontists, March 7, 1938. For it is also well known that both the medical and dental professions need enlightenment along this line. A just comparison cannot be made between medical publicity and orthodontic publicity because the medical profession has had years to educate the people.

The thing that has and always will hamper educational publicity is the fact that there are so many opinions as to how it should be done. In fact, I question whether anyone would subscribe 100 per cent in any case. So, in order that publicity shall be successfully handled, little differences of opinion must be regarded.

Report From the Board of Directors

Dr. B. E. Lischer, St. Louis, Mo.—To comply with the requirements of the new constitution and by-laws, the Board of Directors appointed a committee, and we have prepared this very brief report.

Your special committee on resignations begs leave to submit the following report:

1. Lourie, Lloyd S., Chicago, Ill., a charter member of the American Society of Orthodontists; President of the Society in 1904 and 1905; a frequent contributor of outstanding ability to our annual programs and to orthodontic literature generally; for over thirty-five years an active member of the Society and an eminent practitioner.

2. Suggett, Allen H., San Francisco, Calif., an active member of the American Society of Orthodontists for nearly thirty years; a frequent contributor of ability to our annual sessions; a teacher of orthodontics in the University of California College of Dentistry for over a quarter of a century.

This committee recommends honorary membership to these two former active members, and has received the endorsement of the House of Delegates after presentation in writing in accordance with our administrative by-laws.

Respectfully submitted,

L. M. Waugh
George A. Barker
Henry U. Barber, Jr.
Alfred P. Rogers
B. E. Lischer, Chairman

The recommendation for conferring honorary memberships on Dr. Lourie and Dr. Suggett was accepted and approved.

Report of Constitution and By-Laws Committee

Dr. Frank M. Casto.—I have asked the privilege of presenting the report so that the amendments may be before the Association.

Your Committee on Constitutional and Administrative By-Laws beg to submit the following report:

A copy of the Constitutional and Administrative By-Laws, adopted at the Chicago meeting in April, 1937, was mailed to the members through the office of the Secretary.

The committee was requested from time to time during the year to interpret certain articles, chapters or sections of these which needed clarification.

Chapter I, Administrative By-Laws, which pertains to membership, seemed to need the most enlightenment, especially in respect to members of a constituent society who were not

members of the American Society of Orthodontists. The committee ruled that these persons should make application for membership in accordance with Section 2, Chapter I, Administrative By-Laws.

Other matters of less importance need not be discussed in this report. It is the opinion of your committee that you now have a workable Constitution and Administrative By-Laws which should, with such changes as appear necessary from time to time, serve the Association over a long period.

The following amendments were received by the committee during the year: The first is related to Section 10, Chapter II, Administrative By-Laws, and reads as follows:

> "Section 10, Chapter II, Administrative By-Laws: The Board of Directors shall not recommend to the general body a budget for current expenses of the Association in excess of the estimated annual income."

The second concerns the class of membership and relates to Article III of the Constitution and Chapter I of the Administrative By-Laws.

> The Constitutional Amendment—Article III. "Add item 'D'—Affiliated members."

The Administrative By-Laws amendment—Chapter I; add Section 15:

> "Affiliated members shall consist of members in good standing of foreign orthodontic organizations. They shall have all the privileges of the Association, except voting and holding office, shall be exempt from the payment of dues but shall pay for the official publication of the Association."

The committee now presents these amendments in accordance with Section 1, Chapter XIV, relating to amendments.

Respectfully submitted,
OREN A. OLIVER
H. C. POLLOCK
F. M. CASTO, Chairman

The amendments were approved and passed.

Supplemental Report of the Board of Directors

Secretary-Treasurer Wood.—The only additional report the Board of Directors has is the action of the Ad Interim Committee in the election of Dr. Harry Allshouse, Jr., as President-Elect of the American Association of Orthodontists, to fill the unexpired term of Dr. Frank Delabarre. That was presented to the Board of Directors and was approved unanimously by the Board of Directors, and I wish to report it to the body at this time.

The action of the committee was approved and Dr. Allshouse was elected president for the ensuing year.

Resolution

Secretary-Treasurer Wood.—"The American Association of Orthodontists, meeting in the city of Los Angeles, on the thirteenth day of July, 1938, records its emphatic opposition to any measure such as the proposed 'State Humane Pound Law' which will hinder or curtail animal experimentation as conducted by those fully qualified in biology and medicine.

"It is the belief of this society that the present level of health and humane protection of man and animals, and further advance in our knowledge of the phenomena of life can be maintained only by constant vigilance and by continued study of the nature of vital processes through the experimental investigation of living animals. Every effort should be made to provide the necessary animals for scientific studies rather than to interfere by the passage of hampering legislation.

"We hereby attest that this resolution was adopted at a regular meeting of this society on the date herein mentioned."

Dr. John R. McCoy, Los Angeles, Calif.—In most states they are trying to pass legislation similar to this so-called Humane Pound Law, and in California this comes up in the fall. Our medical schools, our dental schools, our universities will all be hindered. All animal experimentation in the state will have to cease if this law goes into effect. I happen to be on the local committee, and the men who helped in this fight against this humane pound law are Dr. Wilbur, of Stanford, Dr. von KleinSmid, who spoke to you yesterday, and all the men connected with the medical and scientific institutions of the state. I assure you, in passing this, you are helping a good cause, so I second the motion that this be passed.

The motion carried.

Report of the Necrology Committee

Dr. L. M. Waugh, New York, N. Y.—The Necrology Committee submits the following report covering resolutions on the death of twelve of our members: Dr. F. A. Delabarre, Boston, Mass.; Dr. R. Ottolengui, New York, N. Y.; Dr. F. C. Kemple, New York, N. Y.; Dr. H. C. Ferris, New York, N. Y.; Dr. W. H. Gilpatric, Boston, Mass.; Dr. W. J. Brady, Kansas City, Mo.; Dr. R. Dunn, San Francisco, Calif.; Dr. E. F. Buckley, Little Rock, Ark.; Dr. H. C. Johnson, Evansville, Ind.; Dr. R. W. Noland, Des Moines, Iowa; Dr. C. A. Kennedy, Toronto, Canada; and Dr. Frank H. Harrison, Wichita Falls, Texas.

The duty assumed by the committee in preparing these resolutions has been one of sadness because of the great number as well as the prominence of those departed.

May we who remain to carry on the work of our specialty emulate these men by striving for the same high goals of professional advancement.

Respectfully submitted,

MAX E. ERNST
CHARLES J. VOSMIK
OSCAR CARRABINE, Chairman

Dr. Waugh read a portion of the resolutions prepared by the Necrology Committee, the the balance being read by title. The resolutions were adopted.

Report of the Interrelations Committee

Dr. W. E. Flesher, Oklahoma City, Okla.—The Interrelations Committee wishes to report that the general status of the world condition as related to orthodontics seems to be about the same as at the time of the report of this committee in Chicago, in April, 1937.

At this time nothing has come to the attention of the Interrelations Committee that would indicate an especial interest in and warrant the reconsideration of the question of the Third International Orthodontic Congress.

The Interrelations Committee recommends that the Secretary of the American Association of Orthodontists communicate whatever action is taken by the American Association of Orthodontists to the Secretary-General of the Third International Orthodontic Congress.

Report of the Nomenclature Committee

The Nomenclature Committee has, this year, departed from the usual custom of nomenclature committees in this organization. These committees, in the past, have usually made a restricted effort to improve a bad situation, locally, so to speak, rather than making any attempt to improve its constitutional ailments.

After much study, we have come to the conclusion that it is not possible for any scientific group associated with other scientific groups to remedy single-handedly its own nomenclature troubles. These troubles, in our case, are many and varied. It is not necessary to enumerate them all. It is enough to say that they rise from the rapidity with which our profession is developing and from the fact that the men who select our new words are not primarily etymologists.

Believing that any effort on our part, working thus single-handedly and independent of the medical and other scientific fields, would be futile, we have decided, this year, not to attack the etymology and definitions of terms which do not exactly suit us, but rather, to

suggest a plan of procedure by which a closer union could be established between those interested in nomenclature in our profession and those so interested in other professions. Much could be written concerning the studies we have made which brought us to these conclusions but all that is unnecessary.

Medicine already has the B. N. A. (Basle Nomina Anatomica), which constitutes its authoritative system of anatomical nomenclature and which could just as well include every anatomical term used by orthodontists. It also has the National Conference on Nomenclature of Disease, which provides, almost annually an authoritative revision of the Standard Classified Nomenclature of Disease. This could also just as well include every term used by orthodontists referring to diseases or anomalies which we encounter.

Aside from these two classifications there would be, of course, terms referring to appliances, mechanical procedure, etc., which would be either strictly dental or of an engineering nature and which should be kept consistent with mechanical and engineering terminology; then there would be the chemical, physical, and metallurgical terminology which should be studied just as carefully with the object of maintaining consistency with the like terminology in the purely scientific fields.

Apropos of these statements, it is the recommendation of the Nomenclature Committee that the American Association of Orthodontists instruct its newly appointed Nomenclature Committee for the coming year to establish communication with those in charge of revision of the B. N. A. and Standard Classified Nomenclature of Disease, with the object of learning ways and means by which an official affiliation may be brought about. It is further recommended that when this has been done the Nomenclature Committee be empowered to pursue the necessary steps by which authoritative orthodontic terms may eventually be included in the above-mentioned publications.

NOMENCLATURE COMMITTEE
B. W. WEINBERGER
A. LEROY JOHNSON
GEORGE R. MOORE, Chairman.

Report of the Relief Committee

Secretary-Treasurer Wood read the report in the absence of Dr. Harry C. Metz, Pittsburgh:

"As chairman of the Relief Committee, I wish to report that there have been no demands made upon us for relief this year.

"From my experience as a member of the Relief Committee of the Pennsylvania State Dental Society, I find that the demand for relief among dentists is growing, and we never can tell just when it may strike within our ranks. I would suggest that we start a relief fund at once to take care of the emergency when it arises.

"There should be a working agreement between the local orthodontic societies and the American Association of Orthodontists, so that each could carry a part of the burden. This is now being done by the state dental societies and the American Dental Association.

"Respectfully submitted,

FRANK C. RODGERS
H. L. MOREHOUSE
HARRY C. METZ, Chairman."

Report of the American Board of Orthodontia

Dr. Frank M. Casto.—The members of the American Board of Orthodontia have, since the last meeting in Chicago in April, 1937, again endeavored to carry out its aims and purposes.

Following the organization of the American Board of Orthodontia in Estes Park, Colorado, in 1929, several similar boards have been organized in the medical profession. There are now, I believe, some eleven or twelve such boards. Our action seems to have been completely confirmed, and we should be most grateful to those courageous and farsighted men who initiated and carried through the organization of this Board. It has and will continue to elevate the science and art of orthodontics.

One hundred and sixty-two applicants have complied with the requirements of the Board, to whom certificates of proficiency have been or will be issued. Twenty-one of this number were certified during the present meeting.

The Board has been gratified at the attitude of those who have applied for certification. In no instance has there been shown anything but the finest cooperative spirit in complying with the requirements set forth by the Board.

A perusal of the roster to whom certificates have been issued is of interest. Twenty-seven states, the District of Columbia, and three Canadian provinces are represented. The quality and standing of these men, too, is of signal importance. These are significant facts which indicate the success of the project and the efficient manner in which the affairs of the Board have been administered.

It is hoped that every member of the orthodontic profession who is qualified and willing to meet the requirements of the Board will in time receive its endorsement through the issuance of certificates of proficiency. The effect of such a condition upon the advancement of the science and art of orthodontics cannot be overemphasized. The Albert H. Ketcham Memorial Award will be conferred this year upon Dr. Alfred Paul Rogers, of Boston, Mass., a man eminently worthy of the honor. For informative purposes, it may be well to again mention the fact that the American Board of Orthodontia is a corporation, incorporated under the laws of the state of Illinois, and that its management is vested in a Board of seven directors, each of whom is elected by the American Association of Orthodontists.

In closing this report, may I, on behalf of the Board, thank the members of the American Association of Orthodontists for their splendid support to and cooperation with the Board, and bespeak your continued support and cooperation.

Respectfully submitted,

F. M. Casto, President of the American Board of Orthodontia.

Report of the Research Committee

Dr. George R. Moore, Ann Arbor, Mich.—The membership will recall that in the new Administrative By-Laws of the Association, Chapter V, Section 8, the following provision concerning duties of the Research Committee appears: "For the purpose of record as to progress, the Research Committee shall secure, in so far as possible, reports of all researches related to the science of orthodontics that are being carried on by members of the American Association of Orthodontists or by members of other societies. These reports shall be reviewed by the Committee and summarized in its annual report."

Apropos of this section of the By-Laws, the Research Committee has, this year, circularized the entire membership with a questionnaire, soliciting information concerning researches which may be in progress. As a result, we submit for publication with this report a list of seventy research projects reported by members of the organization or by men whom they have referred to us. In each case where the work is being done in collaboration with some institution, the fact is recorded. General headings involved are as follows: Appliances and Materials; Caries During Active Orthodontic Therapy; Endocrinology; Growth and Development; Heredity and Genetics; Nutrition; Radiography; Root Resorption; Submerging Teeth; Temporomandibular Joint; Treatment; and Miscellaneous.

It is the object of the Research Committee to maintain a list of this sort to serve as a clearing house of information concerning research projects relating to orthodontics; and we invite all members of the Association who failed to report when solicited, or who have engaged upon researches subsequent to that time, to inform the Committee immediately of their work.

Respectfully submitted,

Milo Hellman
Gerald Franklin
George R. Moore, Chairman.

AMERICAN ASSOCIATION OF ORTHODONTISTS

REPORT OF THE RESEARCH COMMITTEE

JULY, 1938

NAME OF PROJECT	REPORTED BY	INSTITUTIONAL CONNECTION
Appliances and Materials		
An appliance adjunct.	Charles W. Brunner	Rocky Mountain Dental Products Co.
Universal appliance.	Walter J. Furie Spencer Atkinson	
Appliance designed for stability and control without excessive number of bands, in correction of excessive overbite.	Arthur V. Greenstein	
Chrome metal as a satisfactory material for appliances.	George Cowles Brown	
Metallurgical problems related to orthodontic appliances.	Floyd A. Peyton	University of Michigan, Department of Orthodontics
Physical properties of all dental materials.	Floyd A. Peyton	University of Michigan, Department of Orthodontics
Cold bend and torsion tests on wires.	Floyd A. Peyton	University of Michigan, Department of Orthodontics
Electric spot welding in the construction of orthodontic appliances.	Leonard T. Walsh A. B. Brusse J. Lyndon Carman	
Formulate a specification for colloidal impression materials; determine accuracy of the materials; investigate techniques.	Geo. C. Paffenbarger	A.D.A., Research Fellowship National Bureau of Standards
Caries During Active Orthodontic Therapy		
Study of the nutritional habits and acidophilus count of the oral cavity during active orthodontic therapy, in relation to dental caries.	Hermann Becks	University of California, Hooper Foundation
Control of caries during orthodontic treatment.	Floyd E. Gibbin	
Endocrinology		
The appearance of the teeth, jaw bone formation and arch form in patients suffering from hypothyroidism and with a consideration of orthodontic prognosis.	Hermann Becks	University of California, Hooper Foundation
Interrelation of pituitary and thyroid glands and the effect on bone and jaw development by chronic injections of these hormones following pituitary and thyroidectomy.	Hermann Becks	University of California, Hooper Foundation
Interrelation of pituitary and thymus glands and the effect on bone growth and jaw development.	Hermann Becks	University of California, Hooper Foundation
Interrelation of pituitary and adrenal cortex and their effect on bone growth and jaw development.	Hermann Becks	University of California, Hooper Foundation
Interrelation of pituitary gland and gonads and the effect on bone growth and jaw development.	Hermann Becks	University of California, Hooper Foundation
Effect of (a) low calcium, (b) low phosphorus, (c) low magnesium, (d) low vitamin D diet in above experiments, Nos. 2, 3, 4, and 5, under *Endocrinology.*	Hermann Becks	University of California, Hooper Foundation
Hormone influence upon acromegaloid growth.	C. C. Howard	Good Samaritan Endocrine Clinic
Dwarfism and its relation to malocclusion.	C. C. Howard	Good Samaritan Endocrine Clinic

REPORT OF THE RESEARCH COMMITTEE—CONT'D

NAME OF PROJECT	REPORTED BY	INSTITUTIONAL CONNECTION
Growth and Development		
The correlation between dental growth and osseous growth in the carpal area.	George R. Moore Willard Olson Byron O. Hughes	University of Michigan, Elementary School
Arch relationship and dimensional changes in the deciduous and permanent dentitions.	George R. Moore Byron O. Hughes	University of Michigan, Department of Orthodontics
Establishment of dental-age norms based upon development of individual teeth rather than upon eruption of permanent dentition through mucosa.	George R. Moore Charles M. Waldo	University of Michigan, Department of Orthodontics
An attempt to measure the development of the muscles of mastication as well as the orbicularis oris and its associated muscles.	Leland R. Johnson	
Series of records of physiological growth and development of Japanese and Filipinos from kindergarten to high school age.	Edward C. Hoey	Hawaiian Sugar Planters' Ewa Clinic
A study of systemic disturbances and the physiologic bone age in patients with various types of dentofacial anomalies.	Hermann Becks	University of California, Hooper Foundation
A comparative study of physiologic bone age and delayed time of tooth eruption.	Hermann Becks	University of California, Hooper Foundation
A study of physiologic bone age in patients with partial anodontia.	Hermann Becks	University of California, Hooper Foundation
Development of a procedure to obtain with precision and detail data on growth and development of face and cranium: utilization of procedure to study normal growth; and to study children undergoing orthodontic treatment.	Herbert I. Margolis	
Development of deciduous dentition in fetal jaws.	Geo. M. Anderson M. S. Assenberg (University of Maryland)	
Growth and development of the teeth and dental arches.	Samuel J. Lewis	Merrill-Palmer School and the Children's Fund of Michigan
Eruption of permanent teeth.	Samuel J. Lewis	Merrill-Palmer School and the Children's Fund of Michigan
Mandibular growth	Walter J. Furie Spencer Atkinson	
Growth and development as a result of orthodontic treatment: a quantitative study of malocclusion.	Fred E. Haberle	
Computation of growth changes of underlying structures to the dentition.	Edward Mason Griffin	Griffin School of Orthodontia
Physiologic growth and development of the dentition during the school age.	Richard H. Stucklen	
Changes in the dental arches of cases of normal and abnormal occlusion without treatment.	Harold Chapman	
Correlation of jaw growth with skeletal growth.	C. C. Howard	Good Samaritan Endocrine Clinic
Macroglossia: effect of tongue on dental growth anomalies.	Harry H. Sorrels	
Influence of early extractions of deciduous teeth on development of denture; influence of space maintenance.	Eda B. Schlencker	

REPORT OF THE RESEARCH COMMITTEE—CONT'D

NAME OF PROJECT	REPORTED BY	INSTITUTIONAL CONNECTION
Continued investigation of dentofacial development.	Milo Hellman	
Correlated study of dentofacial development from infancy to maturity.	Charles M. Waldo	University of Colorado, Child Research Council
Heredity and Genetics		
Influence of germinal material on the development of the face.	A. LeRoy Johnson Chas. R. Stockard (Cornell Medical School)	
Studies in the inheritance of the dentofacial complex.	George R. Moore Byron O. Hughes G. Wayne Oglestone	University of Michigan, Rackham Foundation
Race mixture and occlusion in Armenian speaking peoples.	Byron O. Hughes	University of Michigan
Hereditary predisposition in tooth morphology and profile-form among primitive, unmixed Indian groups of South America.	Harry Bernard Wright J. Aldan Mason (Curator, South American Section, University of Pennsylvania Museum)	
Nutrition		
Effect of dietary changes on the bone structure with regard to bone repletion and bone repair.	Hermann Becks	University of California, Hooper Foundation
Vitamin C in citrus fruits and vegetables: its part in tooth nutrition and health.	C. M. McCauley	
Nutrition, growth, and occlusion in underprivileged boys.	Byron O. Hughes	W. K. Kellogg Foundation Camp
Radiography		
A roentgenographic study of the position of the tongue.	John R. Thompson	Northwestern University Dental School
Root Resorption		
Frequency and classification of root resorptions.	Hermann Becks	University of California, Hooper Foundation
Does the movement of teeth resorb their roots or does the resorption occur from other causes?	Allen E. Scott John Marshall	
Submerging Teeth		
Causative factors of the submerging of teeth.	Hermann Becks	University of California, Hooper Foundation
Temporomandibular Joint		
Roentgenographic aspect of the temporomandibular joint during treatment of Class III dentofacial anomalies.	Hermann Becks	University of California, Hooper Foundation
The reaction of the temporomandibular joint to occlusion.	Sidney E. Riesner	
Treatment		
Advisability of treatment of mixed dentures.	Arthur V. Greenstein	
Key ridge	Walter J. Furie Spencer Atkinson	
Early treatment	George Cowles Brown Drs. Parkin, Allen and Pierce	Forsyth Dental Infirmary
Use of rubber bite strip for stimulation: does its use improve results and shorten treatment?	George Cowles Brown	Forsyth Dental Infirmary

REPORT OF THE RESEARCH COMMITTEE—CONT'D

NAME OF PROJECT	REPORTED BY	INSTITUTIONAL CONNECTION
Tissue changes incident to orthodontic treatment.	George R. Moore C. M. Dixon Von K. Frowine	University of Michigan, Department of Orthodontics
Measurement of pocket formation in 500 children between the ages of 7-12 years, before, during, and after orthodontic treatment.	Hermann Becks	University of California, Hooper Foundation
Is retention or extraction of impacted third molars favorable for maintenance of arch form following orthodontic treatment?	Hermann Becks	University of California, Hooper Foundation
Forward drift of teeth post adolescence: maintenance of apparently successful cases.	Arthur V. Greenstein	
The readjustment necessary in cases of missing permanent teeth.	Herbert W. Taylor	
Miscellaneous		
The purpose of orthodontics.	Albert W. Crosby	Committee of Public Information of the New York Society of Orthodontists
The relation between dental defects and speech defects.	Von K. Frowine Henry Moser George R. Moore	University of Michigan, Speech Department
The justification of the methods used by various men upon which to base a fee.	L. R. Sattler	
Study of classification.	S. S. Crouch George Grieve, Chmn. H. C. Bliss Vernon Fisk Stephen Lesco	Orthodontic Club of Toronto
Occlusion in mentally deficient children.	George R. Moore Chas. M. Waldo	University of Michigan, Department of Orthodontics
A study of asymmetries of the face and skull in Philippine crania.	Byron O. Hughes George S. Harris George R. Moore	University of Michigan, Department of Orthodontics
Anthropologic aspects of dentofacial deformities.	Harry Bernard Wright J. Aldan Mason (Curator, South American Section, University of Pennsylvania Museum)	
Does a negative pressure exist in the mouth?	R. D. Calhoun	Northwestern University, Department of Orthodontics
Etiologic factors of delayed tooth eruption in the mouse.	Hermann Becks	University of California, Hooper Foundation

Dr. George R. Moore.—I would like to make one comment about the name of the American Board of Orthodontia, so-called now. It seems to me, in view of some of the changes that have been made in our nomenclature, especially in reference to the name of our journal now called the AMERICAN JOURNAL OF ORTHODONTICS, we should make a request to the American Board of Orthodontia that they change their name. I wish to make that motion now.

Motion carried.

Report of the Publication Committee

Dr. Brooks Bell.—The Publication Committee report with great satisfaction the completion of a contract with The C. V. Mosby Company as outlined in the President's address, and confirmed by The C. V. Mosby Company to our President and the Publication Committee.

We recommend the establishment of a fixed rule that all contributors to our program file all papers complete with illustrations with the Publication Committee two weeks prior to our annual meeting, to facilitate early publication.

Respectfully submitted,

ALFRED H. HIGSON
ARCHIE B. BRUSSE
BROOKS BELL, Chairman.

Report of the Auditing Committee

Dr. P. G. Spencer, Waco, Texas.—The Auditing Committee met and approved the auditor's report. We could find no error, even to one penny, and I submit that we accepted the report as read at our opening session.

GEORGE A. BARKER
GUY M. GILLESPIE
P. G. SPENCER.

Report of the Budget Committee

Secretary-Treasurer Wood.—Dr. Gillespie is here, who is acting in place of Dr. Oliver White as chairman of the Budget Committee. Dr. Gillespie has worked on the budget, and the committee has outlined the budget for the year. The Secretary, an ex-officio member, worked with them, and I will read the following report:

Expenditures

1939

Essayists and Clinicians	$1,000.00
Local Arrangements	500.00
Reporting	400.00
Clinics	150.00
Exhibits	200.00
Printing Programs	700.00
Incidentals	150.00
Program Committee	50.00
Executive Council	150.00
Honorarium, Secretary-Treasurer	500.00
Contingent Fund	300.00
Socio-Economic Committee	100.00
Public Relations Committee	150.00
Subscription for Journal	2,500.00
	$6,850.00

Estimated Income

1939

From Dues	$5,500.00
From Reg. Guests	750.00
From Bonds	143.80
From Savings Account	75.26
From Savings Account	60.00
From Applications	700.00
	$7,229.06

Committee on the President's Address

Dr. P. G. Spencer.—Your Committee on the President's Address wishes to compliment Dr. McCoy and his inclusions and the facility of his graphic summary of our orthodontic problems. The relation of orthodontics to the other professional specialties is a vital one. Our increasing interest and acquaintance with the work and responsibilities of our medical brethren is the only sure means of confining the cooperative spirit which is becoming more and more evident through our contacts with them.

This we recognize can be achieved only as a responsibility to each one of us individually, and one which must be discharged through personal effort.

This and questions of public relations of adequate education and legislation effective in the protection of the public are all perennial in their demands for adjustment and readjustment, and must be continuously studied in order that they shall keep pace with the growth of vision and consistent widening of our abilities to negotiate the orthodontic problem.

There will always be problems of policy in organization and in regard to our financial relations. There will always be preferences as to methods of editing and publishing our proceedings, but the recommendations made by our President to continue the present harmonious arrangement will assure the members of our society that the proceedings will be published promptly and inexpensively.

The Committee wishes to commend The C. V. Mosby Company for their generous cooperation in permitting this society to supervise and indirectly control the publication of our official journal.

The Committee wishes to commend the President for his reference to and support of the several committees which are making a successful effort toward higher education in our specialty and to combat sinister influences which retard professional progress.

Throughout the whole text of the President's address it is apparent that he has expressed a personal insight and understanding of our problems.

The Committee requests early publication of this address in our official journal, and expresses the hope that each member will carefully read this message, which will prove most instructive to all of us.

Respectfully submitted,

FRED T. MURLLESS, JR.
B. FRANK GRAY
P. G. SPENCER, Chairman.

Department of Oral Surgery and Pathology

Edited by

STERLING V. MEAD AND KURT H. THOMA

Articles on oral surgery, radiography, and anesthesia should be submitted to Dr. Sterling V. Mead, 1149 Sixteenth Street Northwest, Washington, D. C. Articles on oral pathology should be submitted to Dr. Kurt H. Thoma, 47 Bay State Road, Boston, Mass.

ANKYLOSIS OF THE TEMPOROMANDIBULAR JOINT*

V. H. KAZANJIAN, D.M.D., M.D., F.A.C.S., BOSTON, MASS.

IT IS the purpose of this article to present a clinical study of 33 cases of chronic ankylosis of the jaw. All of the patients were operated upon by me over a period of 15 years, and the material has been available through the files of the Massachusetts General Hospital, the Massachusetts Eye and Ear Infirmary, and through private case records. I feel that there are certain advantages in having seen and followed these cases personally over a period of years, and since no real unanimity of thought or standardization of methods has come about as yet in this field, it is important to continue the presentation of fairly detailed studies. No radical departures have been made from the usual operative methods, but I hope that there is a gain in simplicity.

DEFINITION

Chronic ankyloses of the jaw are sufficiently complex to require at least a simple plan of classification. They may be divided into two groups: first, those in which the ankylosing factors lie in the joint proper, these being called intra-articular or "true" ankyloses; and second, those in which the pathology lies outside the joint proper, the "false" ankyloses. The intra-articular ankyloses are much more common (28 cases in this series), and they are defined in degree as complete or partial in type. Complete ankylosis is taken to mean in this article less than 5 millimeters of opening power. Generally this means bony ankylosis. Similarly in any individual case, it is important to know whether the ankylosis is unilateral or bilateral. The *extra-articular cases* of ankylosis are similarly classified. Generally, these are partial, fibrous, and unilateral in type. They are less common (5 cases in this series).

ETIOLOGY

The predisposing cause of chronic intra-articular ankylosis of the temporomandibular joint is either disease or trauma. The etiological infection may have occurred in the joint itself, in a suppurative process in the neighborhood of the joint, in the mandible, in the middle ear, or in the mouth. The predisposing injuring agent is usually some sort of external violence transmitted to the temporomandibular joint or joints through the mandible. Fracture of

*Read before the American Society of Oral Surgeons and Exodontists, Atlantic City, New Jersey, July, 1937.

Kazanjian, V. H.: *Surgery, Gynecology and Obstetrics*, September, 1938, Volume 67, Pages 333-348. Republished by courtesy of the Surgical Publishing Company of Chicago.

the neck of the condyle may cause ankylosis. Frequently, because of the slow evolution of ankylosis, the direct connection between cause and effect is unknown to the patient, his family, or his physician. So-called congenital ankylosis is at present considered as evolving from a birth injury, and thus to be traumatic in origin. A recently reported case by Burket does not alter this conception. The end-result of disease or injury may lead to the formation of scars and destruction of the joint.

As it is generally recognized, injury is the most important single cause of ankylosis. A history of injuries, such as blows to the jaw, coasting accidents, falls, automobile accidents, and jaw fractures, was obtained in 8 of the 28 cases of intra-articular ankylosis.

Table I enumerates the etiological factors in the remaining 20 patients. These "unknown" cases followed mumps, poliomyelitis, "convulsions," burns of the face, and "not stated."

Half of these intra-articular ankylosis cases had their onset in the first 10 years of life. The second decade gave rise to 4 cases and the ages above these groups gave rise to 6. Tables II and III will show by their disparity the unusual length of time which elapses between the onset of the condition and its final disposition.

The etiological factor or factors were well defined in the author's 5 cases of extra-articular ankyloses. Postirradiation injury and scarring following the treatment of intraoral carcinoma accounted for 2 cases; injuries involving the coronoid process caused 2 cases, and postdiphtheroid intraoral scars caused 1. Involvement by scar tissue of muscles or soft tissues anywhere between the joint and symphysis of the mandible may limit the jaw movements. The few cases in this series are fair examples of the varied pathological processes and injuries which may bring about this type of ankylosis. Depressed fractures of the zygomatic process if not reduced will create limitation of jaw motion.

PATHOLOGY

The pathological changes found in intra-articular ankylosis at the time of operation vary greatly in extent. The duration of the ankylosis, the etiology, and roentgen studies are of some help in forming a pre-operative estimate of the pathology, but in general one must wait for the surgical exposure of the joint before an accurate picture is had. It is important to know that in these cases, even with complete ankylosis for many years, the unaffected opposite joint remains perfectly normal. Bilateral cases of ankylosis are rather infrequent (4 in this series) and usually follow rheumatoid arthritis, or injury in which the traumatic force is transmitted to both joints by the mandible. Further statistics show in this group that there were 11 cases of partial ankylosis and 17 cases of complete bony ankylosis.

The pathological findings in intra-articular ankylosis present usually progressive degrees of joint destruction (5, 6, 7). The earliest changes are in the cartilaginous and capsular structures. The meniscus is often completely destroyed quite early; the joint space is narrowed by this, and by changes in the articular cartilaginous surfaces. The joint capsule shrinks and adheres to the adjacent structures. Fibrous bands develop and thicken sometimes to

the point of obliterating most of the joint space. These fibrous bands and the scarred joint surfaces may become calcified. The condyle seems to have a special tendency to develop proliferative bony changes until it becomes thick and massive. This is especially marked in the young, because the condyle does not acquire its normal length, and the relative shortening often makes the coronoid process appear longer than the condyle. The mandibular fossa flattens out and becomes shallow. True osteomas and exostoses are possible. Finally the whole joint area may lose its normal landmarks in a mass of bony union.

In the author's experience, true osteomas extending either from the posterior surface of the head of the condyle or the coronoid process are especially noticeable in cases of partial ankylosis. The overgrowth of bone is primarily responsible for the limitation of motion. Therefore it is not surprising that mechanical means of dilating the jaw are unsuccessful.

DEFORMITY

Intra-articular ankylosis occurring in the young (before the age of 15) and present for an appreciable length of time causes great deformity. When the ankylosis is complete the hypoplasia of the mandible is most distinct. In bilateral ankylosis generally there is a symmetrical lack of growth, but in unilateral cases marked asymmetry is present with the chin deviating to the affected side because of the lesser growth of the mandible on that side. There are two explanations offered for this hypoplasia. The first is that the ankylosed joint directly affects an important growth center in the condyle and thus interferes with normal growth. The second is that lack of proper function leads to the hypoplasia. Probably both of these factors play a part. The dental literature in the past has stressed the effects on mandibular growth of misplaced and unused teeth in the young and this may be a third factor.[4] There is considerable evidence that interference with normal growth centers is the most important factor, since destructive and bony changes in the mandible near the angle or involving the ascending ramus from any cause commonly result in hypoplasia of the mandible on the affected side. In osteomyelitis and similar conditions with no joint disease and slight loss of function, such is often the occurrence. Moreover, in bony ankylosis the unaffected side grows almost to normal size despite the fact that it has been largely deprived of its function.

In young patients secondary pathological changes are of great importance, especially so far as function and facial contour are concerned. In the long standing cases of early ankylosis the face is flattened on the unaffected side and full on the affected side. The chin is deviated and retracted to the affected side. The deformity varies directly with the age of onset and with the degree of ankylosis. It varies directly with the duration up to the age of 15 years. The teeth may be in poor occlusion and usually the poorest occlusion is on the unaffected side. Here the normal bite axis changes in the mandible by a certain amount of lingual displacement of the teeth. Poor mouth hygiene and lack of proper dental care lead to much caries and decay in the teeth of these patients. In complete ankylosis there is often a very great degree of decay

on the occlusal surfaces of the teeth. Constitutionally the patients are usually below par. Many show definite signs of malnutrition, but a few show no effects in their general nutrition and constitutional development (Case 7).

In extra-articular ankylosis the pathological process varies with each case. Scarring of soft tissues or the deeper muscles underlies the ankylosis. The intraoral and intra-alveolar mucosa may be involved by dense scars. Fibrosed and shrunken areas in the muscles of mastication in one small area may prevent jaw function. Often the exact site of the scar tissue cannot be determined by inspection and is discovered at the time of operation. Hypoplasia of the mandible in extra-articular ankylosis is very rare.

TABLE I

ETIOLOGIC FACTORS

	CASES
Abscess of the mandible	6
Sepsis of the joint	2
Chronic rheumatic arthritis	3
Zygomatic abscess	2
Temporal abscess	1
Throat infection	1
"Unknown"	5

SYMPTOMS AND DIFFERENTIAL DIAGNOSIS

These patients suffer but slight difficulty with their speech. The limitation in jaw function, the poor mouth hygiene, and the deformity are the main factors of disability. It is surprising that very few give a history of pharyngeal infection or tonsillitis, which would be quite serious in these patients.

A few points in differentiating between the various types of ankylosis are important; one point at least has escaped description in the literature, so far as I have ascertained. In my experience, observation of the patient when he is asked to thrust forward the jaw is of great value and usually enables one to differentiate between intra-articular and extra-articular ankylosis. With the extra-articular lesion the joints themselves are normal and the jaw glides forward equally on both sides and with no deviation to the left or right. With an intra-articular ankylosis there is no forward motion on the affected side and this results in a slight deviation of the chin to the affected side. In bilateral ankylosis (intra-articular), no forward thrust is possible. This valuable sign can generally be elicited. Slight opening and lateral movement are always possible because of the elasticity of the mandible itself, even with complete bony ankylosis.

Roentgen studies of both joints must be made, of course, and are of great aid. Usually the articular lesion can be made out distinctly. Bony changes and overgrowths are visualized and this information may be of aid in the surgical treatment. In the early cases of intra-articular ankylosis the shortening of the ramus on the affected side is notable. Blair has described the presence of a deepened pre-angular notch on the affected side in these cases.

To recapitulate, the examination of the patient should bring out several important points. In the usual case of intra-articular ankylosis, the chin is already deviated to the affected side. If there is only partial ankylosis, it will

be noted that still further deviation of the chin to the affected side occurs on opening the mouth. At any rate the same sign may be elicited by asking the patient to thrust forward the jaw. These actions determine the side affected. When no forward thrust is possible the ankylosis may be considered bilateral.

TABLE II

AGE AT ONSET OF ANKYLOSIS

	YEARS	CASES
A	From 1-10	17
B	From 11-20	4
C	From 21-52	5
D	Unknown	2
		Total 28

TABLE III

AGE AT TIME OF OPERATION

	YEARS	CASES
A	From 1-10	4
B	From 11-20	15
C	From 21-52	9
		Total 28

With extra-articular ankylosis there is no interference with joint function so far as its sliding forward is concerned and the patient readily can thrust the jaw forward.

The history and careful inspection are of especial value in extra-articular ankylosis for determining on which side the lesion lies. At times the patient volunteers that the right or the left side "catches" and thus affords an additional clue (Case 1). In extra-articular ankylosis it often may be impossible to go any further than to determine the side affected and to leave until the time of operation the discovery of the specifically involved area of ankylosing scars.

TREATMENT

A. Mechanical devices. Mechanical devices are useful in a very few cases. These are, first, in mild partial ankylosis cases due to cicatricial bands *outside* the joint proper; and second, in some early rheumatoid arthritic cases. After extensive plastic operations about the face, mechanical devices are useful to hasten the development of jaw function. Similarly these devices and exercisers are used after injuries and surgery involving the soft tissues of the mouth. *But in chronic intra-articular ankylosis they have no place.* In my hands they have proved a complete failure, and this seems to be the consensus with others at this time.[6] The most useful type of mechanical device is one which gives continuous expansive pressure. For this reason the author often provides fairly stiff rubber tubing which is just too tight to fit well between the teeth, to be used several hours daily. This wedging should not be enough to cause any sense of fatigue to the jaw. Larger tubes are substituted later. The author has tried several forms of more complicated apparatus and many have been described which are effective exercisers or dilators. One such apparatus (Fig. 1) which I use works by the constant pull of elastic bands.

These force down the lower half of the apparatus which is attached over several lower front teeth by German silver caps. This sort of device or a similar variation can be safely used in a certain number of special cases of *extra-articular ankylosis.*

Forcible opening of the ankylosed jaw under anesthesia is to be condemned unless there is some surgical emergency. Such procedures always traumatize and perhaps hasten the formation of complete bony ankylosis.

The author, in 1 case of partial intra-articular ankylosis, opened the jaw under general anesthesia and left it open with an inserted gag. Later, mechanical devices and exercisers were used faithfully for 6 months and in spite of this, limitation rapidly increased. Two years later complete bony ankylosis developed which was relieved by arthroplasty. In several other cases in this series a history of such forcible dilatation was obtained, and in no case had the procedure been helpful.

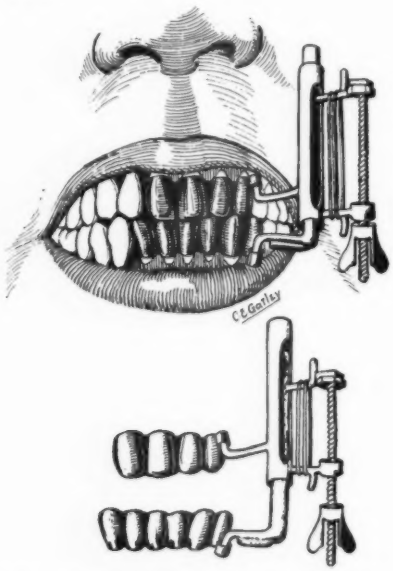

Fig. 1.—Mechanical exerciser for the jaw, which works by the constant pull of elastic bands. The apparatus is attached over several lower front teeth by metal caps. It is used only in a limited number of special cases of extra-articular ankylosis.

B. Surgical considerations. Before entering upon the actual description of the operative technique, I would present a few observations concerning the selection of cases and a consideration of procedure. I believe that only a short period of observation is necessary to determine the presence of true intra-articular ankylosis. As has been pointed out, in these cases the use of exercisers and manipulations is futile. Second, there seems to be no valid reason to delay surgical intervention because of the youth of the patient. The youngest patient in this series was 5 years of age. Early surgery may prevent deformity and alleviate more formidable procedures in the future.

In cases in which bilateral ankylosis is present there is no necessity for a double simultaneous operation on both joints. In 4 such cases one joint was operated on at one occasion and the second joint at a later date. Two of these patients had chronic rheumatoid arthritis and in 1 of them, for reasons

beyond our control, the second operation was performed almost 2 years later. The lack of immediate use of the newly created joint thus does not seem to affect the results (Case 6). It will be noted later that it has not been my custom to use mouth gags or dilators after operation, or to rush the joint into immediate use, and I do not hesitate to delay non-use of the fresh arthroplasty by postponing the second operation to a later date in bilateral cases. It is interesting that 2 bilateral cases were the result of chronic rheumatoid arthritis with multiple joint involvement. Dorrance *et al.* have warned against surgery in such cases but in the 3 cases in this series caused by chronic rheumatoid arthritis, the functional results were excellent and were doubly important in their results by improving the nutrition of the patients.

When a secondary deformity is present, no effort is made at correcting it at the same time that the arthroplasty is performed. I do not feel that mandibular retrusions of this type should be corrected by surgical procedures through the ascending ramus. No exception is made in these cases for this reason, and for the reason that simultaneous correction of the retrusion would usually require a more extensive surgical sectioning, often on both sides. This procedure can be done at a later date more safely and adequately (Cases 7, 8, 10).

Several approaches to the temporomandibular joint and a variety of incisions have been and are being used at the present time. In the past nonvital materials were interposed between the freshly created bony surfaces at the time of operation, but today only living transplants or pedicled flaps enjoy any consideration. The necessity for the use of some material to cover fresh bone ends in arthroplastic surgery is generally recognized as an important principle, and I feel that the mandibular arthroplastics should form no exception.

Whatever the approach to the joint, a further important point lies in creating the bony gap high up in the ramus and with this in mind, sectioning through the neck of the condyle or completely across the ramus at this level will result in optimal functional results.

The only important approach to the joint used in this series aside from the usual vertical incision to be described has been an external incision below the border of the mandible at the angle. This external incision is not new and has been emphasized recently by Risdon. Its main advantage to my mind lies in the fact that it affords an excellent avenue for explorations of the ascending ramus and thus it is of great value for the purpose of exploration of the masseteric and pterygoid regions for scar tissue (Cases 1, 4).

As is generally well recognized, an adequate operation on the temporomandibular joint for arthroplasty must be made as safe as possible in several respects. First, must be borne in mind the danger to the facial nerve of operative procedures in this field. Second, the proximity of the internal maxillary artery to the neck of the condyle is an important surgical fact. Finally, the rich venous supply makes operative and postoperative hemorrhage a constant danger, and the surgeon must be prepared to deal with it.

The incision used by the author lies directly in front of the ear (Fig. 2) but generally it is not carried downward to a point over the level of exit of

the main trunk of the facial nerve. Also the primary incision is made only through the skin, and only by gross carelessness could it penetrate to the depth at which the trunk or the main divisions of the nerve lie. The branches of the facial nerve supplying the frontalis and orbicularis muscles are well anterior and out of the operative field. But in spite of this they may be stretched and suffer temporary paralysis. To guard against injury to the important blood vessels, as it will appear later, the use of surgical burrs or the gigli saw for bone resection is discarded. All cutting is carried out under direct vision with up-cutting bone punches, rongeurs, and at times the chisel.

Anesthesia. Anesthesia presents certain difficulties in these cases. Careful preparation of the patient and a little forethought may prevent undesirable possibilities. Vomiting is particularly dangerous and apparatus for suction should be available during the operation and at the patients' bedside during recovery from anesthesia. Maintaining an airway may be difficult since the tongue cannot be reached and pulled upon. Before anesthesia is given, a 1

Fig. 2.—Photograph showing the incision line for arthroplasty.

centimeter heavy rubber tube may be inserted over the tongue through open spaces which these patients always have through loss of previously extracted teeth, and this may be inserted deeper into the pharynx later, and thus provide an additional airway. Nasal tubes may be used for etherizing or to provide an additional airway. In this group of cases rectal anesthesia was used occasionally and avertin and ether combinations in other cases. As an additional precaution, a tracheotomy set should be ready and available, although in my experience its use was never required.

Operation. The following is a rather detailed description of what has proved to be in my own cases a successful and efficient method of operating on true intra-articular ankylosis of the jaw.

A vertical skin incision is made just anterior to the ear, and extending its entire length. The superficial temporal vessels are found and either tied off or retracted posteriorly.

The temporal fascia is now located and the zygomatic process of the temporal bone is exposed as a necessary landmark. Just below the zygomatic

arch there will be found the temporomandibular joint and the head of the mandibular condyle. The outline of the condyle is usually prominent and it can be easily defined no matter what changes have taken place in or about it.

The further procedure is to cut down upon the condyle with a vertical incision and to make a subperiosteal exposure of the head and neck of the condyle. The subperiosteal exposure is now carried posteriorly until the posterior upper border of the condyle is well defined and clear for the distance of one-half inch. It is now possible to begin the forward resection of a segment of the condyle. With an up-cutting Kerison punch forceps it is possible to proceed anteriorly toward the sigmoid notch with a high degree of safety. By keeping within the periosteum and carrying out cutting procedures under direct vision, there is little danger to the internal maxillary artery, which lies just deep to the neck of the condyle. The use of a half curved gouge-like chisel is often useful when the condyle is very thick. The superficial part of

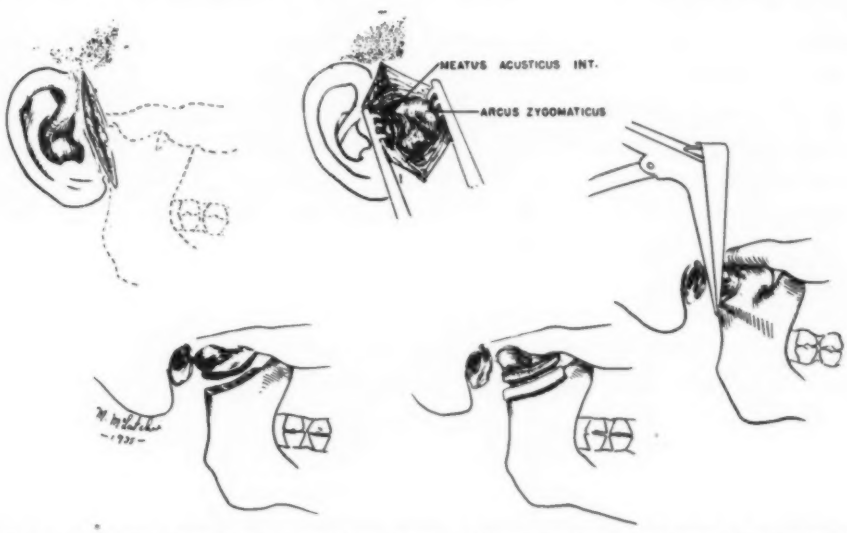

Fig. 3.—Diagram showing the various steps in the operative procedure for arthroplasty of the temporomandibular joint. Incision line; exposure of operative field; position of the back biting forceps at the initial cutting; the line through which definite section of bone is removed; a sufficient amount of fascia is inserted between the cut ends of the bone to eliminate "dead" space.

the resection may be carried out with the chisel, biting instruments being used for the deeper parts. The segment of bone removed should be at least a quarter of an inch in width (Fig. 3).

In some cases the sigmoid notch is seen to be very shallow, and if this is so the resection is carried out for the entire width of the ramus. Similarly the resection must be carried across the ramus when the coronoid process is osteomatous or when it is seen to be interfering in any way with the function of the mandible.

No unusual instruments for retraction are necessary for the above procedures. A certain amount of traction on the tissues is necessary to maintain exposure, and the use of the head mirror or head lamp is of considerable aid in obtaining the proper lighting of the field.

When the resection is completed, an assistant is directed to open the mouth. An excursion of two to three centimeters is discovered to be pos-

sible. At this time an inspection of the temporomandibular articulation may show purely fibrous joint changes and scarring, and, if this is the case, the head of the condyle may be dissected out, thus creating a larger bony gap. If there is any bony union, no such attempt is made since it would be dangerous because of the proximity of the middle cranial fossa.

The operation has not been particularly bloody; generally it is simply a matter of controlling venous oozing. In one case considerable venous bleeding was encountered which was controlled readily by gauze packing. Fascia lata was substituted for the gauze at the end of the operation under slight pressure and acted as a good hemostatic. In another case venous oozing at the very end of the operation was brought under control similarly with the fascia lata transplant. The oblong segment of fascia lata transplant (about 1.5 by 2.5 inches) is inserted into the area from which the bony segment was removed. An attempt is made to tuck the edges of the transplant under the bone ends, but it is not sutured to the surrounding structures. It has great immediate value in filling the dead space between the bony stumps and in controlling immediate or postoperative filling of the area with hematoma.

The wound is closed with a few deep catgut sutures, and a superficial drain, which does not come in contact with the fascia lata transplant, is placed in the upper end of the wound. A pressure bandage is applied over the usual dressings. The patient's mouth receives no special attention or care at this point. No mouth gag or other apparatus is used.

Postoperative care. A liquid diet is given to the patient and the jaw kept entirely at rest for 1 week. The drain is removed in 24 hours. The patient is advised against chewing or working the jaw for several days. It is the author's belief that this period of rest insures viability to the transplant and thus helps prevent a recurrence of the ankylosis. Faster and cleaner healing results in the immobilized wound.

Postoperative complications. In none of the cases in this series did any serious sepsis occur. A few cases drained considerable serum through the drain site for a few days. Hospitalization over 3 weeks was never necessary. No permanent paralysis through facial nerve injury occurred in this group of cases. In a few patients temporary paralysis of the musculi occipito-frontalis and the orbicularis oculi developed, lasting up to 4 or 5 weeks. One operative failure resulted (Case 5) necessitating a second operation.

Most important is the early institution of dental care of which the patient may stand in great need. Proper teeth will thus make possible efficient mastication. In the follow up of cases, it has been found that improvement of function for 6 months generally means a good prognosis.

Follow-up. On discharge the patients were advised to increase the use of the jaw gradually, by definite periods of gum chewing and by the mastication of tough food. The use of active motion and not passive methods was the plan adopted. No apparatus or exercisers were used in any case. A most detailed report was available in 29 cases by virtue of a questionnaire sent to the patients recently. Needless to say, the importance of follow up and observation for years is of extreme value in this type of reconstructive surgery. Four patients were followed in the clinic after operation but did not

answer the questionnaire. In all the successful cases the new joint or joints were remarkably free of pain or discomfort.

CORRECTION OF DEFORMITY

Surgical correction of the retruded mandible to improve the dental occlusion and to relieve the patient of a notable deformity is necessary in a certain number of cases. As stated no attempt is made by the author to combine the surgical treatment of ankylosis and that of retrusion. After the arthroplasty, proper dental care and orthodontic procedures may in themselves bring about an efficient occlusion. Corrective surgery must be undertaken with future orthodontic or prosthetic necessities and possibilities in mind; it sometimes is better to limit the advancement of the mandible to less than the ideal esthetic position for such reasons. Purely cosmetic surgery is always possible for building up the chin without disturbing the dental articulation (Case 8). On the other hand, with extreme shortening of one side of the mandible, sometimes as much as 2.5 to 3 centimeters, orthodontic treatment and considerations become less important than the correction of the retrusion for improvement of mandibular function.

In general, correction of the retruded mandible in children is best delayed until the permanent bicuspids have erupted, thus enabling intelligent postoperative orthodontia. For this reason it is best with children between the ages of 5 and 10 to have corrective surgery delayed until the permanent bicuspids have made their appearance.

The author makes use of an oblique or an "L" shaped section in the body of the mandible in cases of unilateral retrusion. The surgical procedures involved do not differ in these post-ankylosis retrusions from those resulting from fractures, osteomyelitis, or other causes of this deformity.

The operative procedures are carried out intraorally, the main purpose being to elongate the short side of the mandible.

Operation. An incision is made over the crest of the alveolar ridge beginning in the retromolar region and coming forward to the second bicuspid or even further forward. Adequate dental splints are prepared for control of the fragments after separation of the parts. It is sometimes necessary to extract one tooth if the section cannot be made without passing through the tooth root. The next step lies in exposing freely the buccal side of the lower jaw as far as it is deemed necessary. Then with a surgical burr the mandible may be cut through diagonally, as seen in the diagram (Fig. 4).

Holes are made in the extreme ends of the disconnected bone with a surgical burr. A brass wire (No. 20 gauge) may be used as a single suture, the ends being twisted together, and by this procedure as much as an inch of lengthening may be obtained. In his recent cases, the author has in addition utilized an external pull on the symphysis to obtain a more exact and controllable advancement of the symphysis. This is effected by passing a wire suture directly through the symphysis and attaching to this an elastic band leading to a bridging arch of wire coming down over the midline of the face from the forehead. The wire arch or bridge rests on a forehead frame imbedded in dental composition and also on a band on the upper incisors. An

extension over the chin affords a point of attachment for the elastic band (Fig. 5). A stab wound is made leading to under the jaw line externally and a rubber dam drain is placed in that site (removable externally). The intra-oral incision wound is now sutured and the upper and lower jaws are fastened together by elastic bands attached to dental splints previously prepared and cemented to certain teeth. The brass wire may be cut and removed in 3 to 4 weeks, but careful maintenance and after-care of splints and tension of the elastics are necessary for some time.

The correction of bilateral retrusion of the mandible involves the carrying out of the same procedure on both sides at the same operation. The incision may be made as in Figure 6.

SUMMARY AND RESULTS

Thirty-three cases of chronic ankylosis of the jaw operated on by the author over a period of years have been reviewed. Better standardization

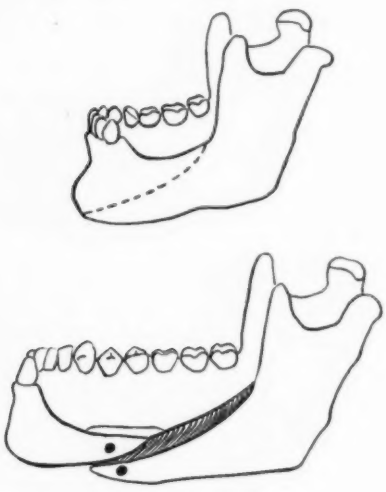

Fig. 4.

Fig. 5.

Fig. 4.—Diagram showing diagonal cut through the body of the mandible for the lengthening of the short side of the mandible.

Fig. 5.—Photograph showing method of pulling the chin forward after sectioning of the bone. The median bar is anchored to the forehead and the upper teeth. A brass wire is passed through a hole at the symphysis and comes through the skin so as to form a loop in front of the chin. An elastic band extends from the wire loop to the bar in front.

and greater simplicity in operative procedure may be claimed except in the 5 cases of extra-articular ankylosis. Each of these cases presented an individual problem. The chronicity of true intra-articular ankylosis and its progressive character should be better realized and earlier operative treatment should be instituted; non-operative treatment is without value. The importance of detecting the presence or absence of horizontal jaw motion as a differential diagnostic point has escaped description in the literature; its applications are here noted.

As to treatment, it may be stated that operation is rarely contra-indicated. Arthritics benefit as greatly as do other types of patients. Further, in cases of bilateral ankylosis one side may be operated on at a time and delay in instituting the use of the new joint seems to be no factor in the end-results.

The immediate use of mouth gags or dilators after operation has not been found necessary. Correction of mandibular retrusion when present is not attempted simultaneously with the creation of the new joint.

In the author's operative technique, a simple pre-aural vertical incision, the resection of a sufficient bony gap with the aid of the Kerison back biting forceps and the use of fascia lata transplants have all been necessary and simplifying procedures. Serious hemorrhage and permanent postoperative facial paralysis did not occur in this group. In one case (Case 5) a second operation was necessary and this was successful. In a second similar case of failure, the patient will be operated on again (V. D.).

The 10 case reports present fair examples of the more unusual problems.

The technique for correction of secondary deformities of the mandible and the importance of dental and orthodontic assistance are described and noted.

Finally the value of prolonged follow up of these cases is indicated if any valid conclusions are to be drawn.

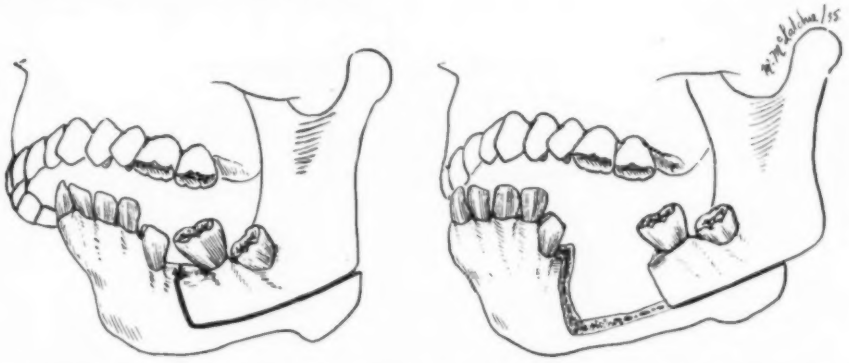

Fig. 6.—Diagram showing L shaped cut which may be used bilaterally for elongating the body of the mandible.

Case 1. Ankylosis from injury to coronoid process; approach from below angle of jaw. T. B., male, aged 16 years. This patient was first seen on August 2, 1935, complaining that he was able to open his mouth only one-fourth of an inch. A history of an accident 12 years previously was obtained, at which time the patient fell, running a pencil into his left temporomandibular joint region. Examination showed a complete ankylosis which appeared to be extra-articular. No clue could be obtained as to the ankylosing factor. The patient's statement that he felt a "catch" on the left side had to be given serious consideration. The roentgen examination was entirely negative and showed normal joint outlines.

On May 2, 1936, the patient was operated on through an external incision extending from the angle of the jaw on the left side forward about half way along the lower edge of the mandible. The masseter muscle was located and detached from the ramus at its insertion. The periosteum and remaining tissues were elevated from the posterior and posteromedial aspects of the ramus up to the mandibular notch. The ramus was divided by narrow biting forceps about one-half inch below the mandibular notch. The coronoid process was then resected because it was thicker than normal and it appeared to be pressing

tightly against the posterolateral aspect of the left maxilla. The jaw could immediately after this be opened almost 2 inches. The wound was closed in anatomical layers (Fig. 7).

The exposed part of the internal pterygoid muscle was sutured to the masseter muscle as a means of creating a false joint where bone was removed. Examination of the patient months later showed that he was able to open his mouth wide, even though the sectioned area of the ramus had consolidated, because the original cause for the ankylosis was at the region of the coronoid process.

This case demonstrates the necessity at times of choosing the approach under the jaw line near the angle of the mandible whenever the operator is in doubt as to the exact site of the difficulty causing the ankylosis. It is a valuable incision for exploratory purposes.

The following case is of interest because it demonstrates the failure of a variety of mechanical devices and jaw dilators which were conscientiously used with no improvement in the patient's condition, over a period of 3 years.

Fig. 7.—Roentgenogram following the removal of section of ramus and coronoid process (Case 1).

Case 2. Partial ankylosis with osteoma; operative treatment for ankylosis after failure of various dilators. P. C., male, aged 13 years. This patient was first seen in 1930, with a history of falling at the age of 4 and striking his chin. Three months following the injury a limitation in the opening of his jaw was discovered, and this was described as becoming more evident in the past 9 years.

On examination the mandible was found on opening to move apart only 2 centimeters from the maxilla. The occlusion of the teeth was good and there was no gross deviation of the mandible although there was present a small degree of retrusion (Fig. 8). Some fullness of the face was apparent about the right temporomandibular joint. When the patient attempted to thrust the mandible forward deviation to the right could be detected. Roentgen examination showed thickening and shortening of the right condyle, and proliferative bone changes in the mandibular fossa, and the zygomatic arch (Fig. 9).

In view of the 2 centimeter opening noted, no surgery was advised for 3 years but various mechanical devices were used in the hope that enough movement might be gained to obviate surgical interference. Unfortunately, all such attempts failed. On the contrary, the limitation of the jaw movement gradually increased, so much so that his dentist complained that he was not able to perform ordinary dental operations under such circumstances.

The patient was operated on March 17, 1934, in the usual manner. The condyle was almost an inch thick, and there was a large osteoma projecting

Fig. 8. Fig. 11.

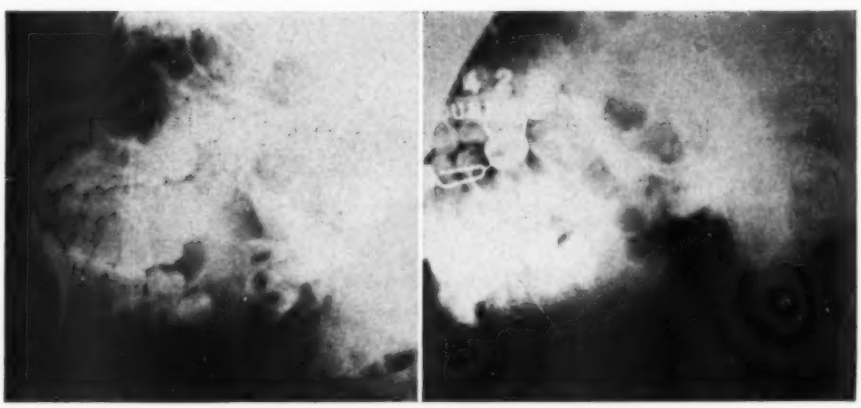

Fig. 9. Fig. 10.

Fig. 8.—Photographs of patient with partial ankylosis. The lower jaw is slightly underdeveloped (Case 2).

Fig. 9.—Roentgenogram showing large osteoma at the neck of the condyle (Case 2).

Fig. 10.—Roentgenogram showing the osteoma and head of the condyle removed (Case 2).

Fig. 11.—Photograph showing patient after operation (Case 2).

medially into the pterygoid region. The glenoid cavity was quite flat and abnormal in contour and there were present heavy fibrous bands between the head of the condyle and the mandibular fossa. Considerable venous hemorrhage was encountered during resection, but it was controlled by gauze packing. After resection was completed the head of the condyle was dissected from the joint with a scalpel (Fig. 10). There were no postoperative com-

plications and the immediate function of the mandible has remained satisfactory for the past 2 years (Fig. 11).

Case 3. Bilateral ankylosis in chronic progressive multiple arthritis. A. G., female, aged 31 years. This patient was first seen on admission on December 27, 1927, complaining of progressive ankylosis dating back to an attack of multiple arthritis 15 years previously. For several months at that time the jaw joints had been painful. Examination showed a complete bilateral ankylosis. An upper dental plate was present which the patient stated she had not been able to remove for 4 years. Roentgen studies indicated joint changes and osteoma formation in both condyles.

On December 29, 1927, the left temporomandibular joint was operated on in the usual manner. After resection of the condyle in this case a fat and fascia pedicle flap was swung into the dead space. On January 14, 1928, the right temporomandibular joint was operated on and a fascia lata transplant was used on this occasion. Within 3 months the patient was able to open her

Fig. 12.—Photographs showing pre-operative and post-operative views of patient with bilateral, complete ankylosis of temporomandibular joint. Patient was also the victim of chronic, progressive multiple arthritis (Case 3).

mouth about an inch. At this time several of the lower bicuspid teeth were extracted and this caused a flareup of her arthritis causing the patient to go to bed for several weeks. On the last admission to the hospital, July 20, 1935, for arthroplasty of a hip joint, the jaw function was still further improved.

This case is of interest in that the success of arthroplasty is demonstrated in a patient with chronic progressive multiple arthritis (Fig. 12).

Case 4. Extra-articular ankylosis from deep radiation scar. D. W., female, aged 24 years. The patient developed an ankylosis of the jaw following the surgical removal 1 year previously of a squamous cell carcinoma of the upper jaw and extensive irradiation of the parotid regions by the implantation of gold radon seeds. Considerable sloughing of tissue and bone followed for some period and for the past year gradual diminution of jaw movement had occurred until the excursion was about one-fourth of an inch. Several months previously a forcible opening of the jaw had led to a fracture of the mandible but no improvement in function.

On examination the buccal mucosa was normal in appearance. A small fistulous opening was present in the mouth opposite the tuberosity of the maxilla. The right parotid gland was atrophic. Roentgen examination showed normal mandibular joints and some loss of bone in the right ramus. Attempts to dilate the jaw gradually by various mechanical means failed entirely and operation was advised.

On July 1, 1936, under ether anesthesia, a 2 inch incision was made just along the lower border of the right mandible forward from the angle. The angle of the mandible was exposed subperiosteally and a good deal of scar tissue discovered, adherent to the anterior border of the ascending ramus. The coronoid process was missing. A segment of the ascending ramus as well as the head of the condyle was resected about an inch above the angle of the jaw and a large area of dense fibrous scars was uncovered in the pterygoid region (Fig. 13). The scar tissue was dissected out and this resulted in an

Fig. 13.—Roentgenogram showing ankylosis from deep radiation scar. Postoperative roentgenogram shows the amount of tissue missing (Case 4).

exposure of the oral cavity as far as the third molar along the buccal fold. The jaw could now be opened freely. Intraoral packing was introduced and the external wound was closed with silk sutures.

This patient was observed carefully for some time. It was felt that reformation of scars might necessitate an intraoral operation and skin grafting, but this did not prove necessary and the patient has a practically normal jaw function at the present time.

The patient was last seen December 7, 1937. The function of the mouth seemed adequate. No handicap in masticating food was present. A rather marked depression was present in the right parotid region due to atrophy of the parotid gland from irradiation and absence of the head of the condyle. In this case also the lower approach from below the angle of the jaw proved satisfactory.

Case 5. Ankylosis following injury; failure of first operation to correct. E. H., female, aged 11 years. This patient was first seen July 11, 1935, with

the complaint of progressive ankylosis of her jaws of 5 years' duration. At that time she had injured her jaw in a coasting accident. Examination showed only slight retrusion and a partial ankylosis. The excursion of the mandible was one-half inch and there was no definite deviation present until the jaw was opened or thrust forward, when a slight deviation to the left was visible. After confirmatory roentgen studies the patient was operated on in the usual manner on September 6, 1935, and the immediate results were good. The patient had a 1 inch excursion at this time and for about 2 months longer. At this time gradual diminution of opening began to take place and in a few months her original condition was present. Roentgen studies showed a great increase in bony shadows about the joint since the first operation.

On September 12, 1936, the patient was operated upon again. A large osteomatous process was discovered connected with the coronoid process. This was removed and a more extensive resection in the upper part of the ramus was performed.

Since this second operation, function and results have been satisfactory. I am unable to be certain as to why this patient needed a second operation. From the roentgenologist's descriptions and studies it seems that considerable regrowth of bone took place. The best simple explanation might be that the original resection was not sufficiently extensive.

Case 6. Delayed operation on second joint with no ill effects. G. B., female, aged 36 years. This patient had a complete ankylosis of the jaw when first seen December 13, 1927. She stated that she had developed rheumatoid arthritis 4 years previously with multiple joint involvement. Several other joints were practically ankylosed and in the past year her mouth had stiffened until she could no longer open it. The patient was emaciated and in poor general health but it was felt that her nutrition would be improved and that an arthroplasty was indicated. In this case a preliminary forcible dilation had been performed under anesthesia for the purpose of extracting several teeth to improve her mouth hygiene which was dangerously bad.

After x-ray studies, the left joint was operated upon on January 7, 1928, with no unusual complications resulting. In this case an efficient joint resulted with the use of a pedicled superficial fascia flap instead of a fascia lata transplant. Almost 2 years later, December 31, 1929, the right temporomandibular joint was operated upon for ankylosis. Since then the jaw function has been satisfactory.

Case 7. Correction of complete bony ankylosis and external deformity. W. B., male, aged 27 years. At the age of 8 years this patient reports that he had a tooth extracted and that his jaw was fractured at that time. Infection set in which took a long time to clear. Since then progressive limitation of the movements of his jaw developed. The patient had not been able to move his jaw in the last 12 to 15 years. His only method of obtaining nourishment was to take liquids or to force firmly mashed food through an open space from missing teeth. In spite of this handicap he had had no serious disease, but he did have frequent toothaches.

Examination showed an unusually well developed and well nourished person. He had a complete bony ankylosis of the temporomandibular joint affecting the left side. The lower teeth on the left side were missing, while the right upper and lower teeth were interlocking each other. This interlocking was accentuated by extensive decay of the occlusal surfaces of the teeth. There was present the usual external deformity of the lower half of the face, the mandible being retracted and deviated to the left side. The left half of the mandible was much shorter than the right half (Fig. 14). The x-ray report showed the left temporomandibular joint completely obliterated with a large osteoma involving the neck, the sigmoidal notch, and coronoid process of the lower jaw, and the base of the zygoma (Fig. 15).

On October 5, 1935, under avertin and ether anesthesia, the operation was performed in the usual manner, as described in the text. Considerable difficulty was experienced in cutting through the neck of the condyle which had assumed a very large size, almost 1 inch in diameter.

Fig. 14.

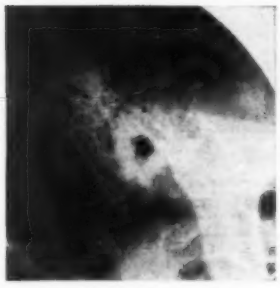

Fig. 15.

Fig. 14.—Pre-operative photographs of patient with complete ankylosis of the temporomandibular joint, showing definite shortness of the left mandible and retraction and deviation of the chin to the left side (Case 7).

Fig. 15.—Left. Roentgenogram showing very thick bony ankylosis (Case 7).

As a postoperative complication there developed temporary paralysis of the facial nerve fibers to the orbicularis oculi and the frontalis. This paralysis lasted about 6 weeks. The patient at the time of his discharge from the hospital on October 13, 1935, was able to open his mouth about one-half inch. He was instructed to start using his jaw freely. On October 30, 1935, and November 6, 1935, all the badly decayed teeth were removed (eight in all) thus putting the mouth in a healthy condition. The patient made an unusually good recovery in the following few weeks; and he was able to open his mouth to almost normal limits (Fig. 16). His condition was now favorable to planning another operation for the correction of the external deformity.

The patient was sent to the hospital and operated on December 5, 1935. For anesthesia, avertin and local anesthesia by mandibular injection of 4 cubic centimeters of 2 per cent novocain supplemented by another 2 cubic centimeters of novocain to the buccal mucous membrane was used. An incision was made over the crest of the left alveolar ridge (where the teeth were missing) extending from the median line to the third molar region. The

buccal surface of the mandible was exposed freely; the soft tissues were held back with retractors and with surgical burrs, a cut was made through the bone, beginning at the retromolar region diagonally forward and downward to the cuspid region (Fig. 4). A hole was drilled at each end of the separated bones and these were then wired together. The twisted ends of this wire were allowed to protrude through the buccal mucous membrane (Fig. 17).

Fig. 16.

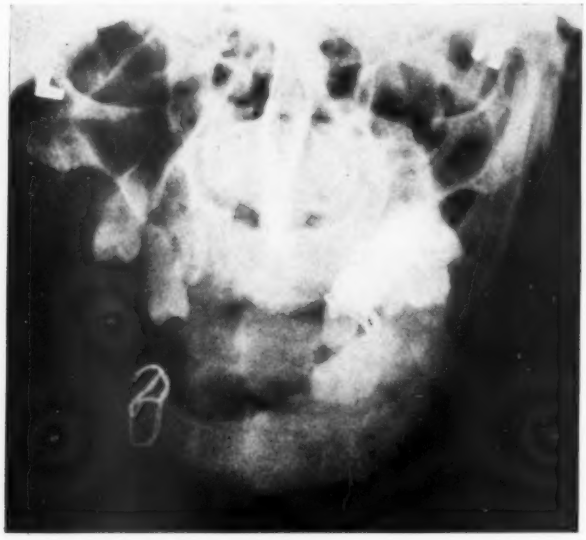

Fig. 17.

Fig. 16.—Postoperative photograph of patient (Case 7).

Fig. 17.—Correction of external deformity by elongating the short side of the mandible. Roentgenogram shows the wire suture connecting the two ends of the bone, twisted and cut short, and allowed to protrude through the mucous membrane of the mouth (Case 7).

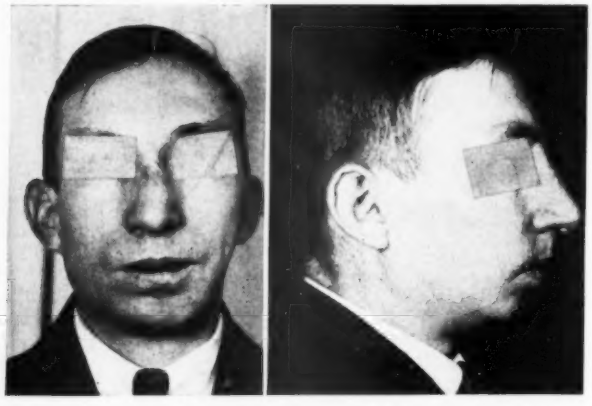

Fig. 18.—Postoperative photographs of patient, following operation for correction of the external deformity (Case 7).

As soon as the patient recovered from the effects of the anesthesia, the upper and lower teeth were joined together with intermaxillary wiring in their new position. The purpose of this operation was to elongate the short side of the mandible. The patient was discharged from the hospital on December 10, 1935.

On December 27, 1935, the wire that connected the two ends of the mandibular stumps was removed under local anesthesia. On January 23, 1936 (50 days after the operation) the intermaxillary wires were discarded, as

there was complete union of the bone. The patient was sent to the Harvard Dental School clinic where suitable artificial dentures were made for him (Fig. 18).

CASE 8. Complete ankylosis; corrective operation for deformity. B. G., female, aged 20 years. This patient gave a history of an abscess of the right side of the mandible at the age of 13 months, followed by necrosis of the bone, the treatment of which required two or three operations. As she grew older, the jaw failed to develop, and there was limitation of the movements of the jaw which gradually became more marked until she developed complete ankylosis and marked underdevelopment of the mandible. Therefore, it had been necessary to remove the two mandibular central incisors in order to feed the child.

Fig. 19.—Roentgenogram showing complete bony ankylosis on the right side: duration, since childhood (Case 8).

Examination on April 23, 1930, showed complete bony ankylosis involving the right temporomandibular joint (Fig. 19). The teeth were in a badly decayed condition. There was a marked underdevelopment of the mandible and retraction of the chin (Fig. 20). Measurements showed the right side of the mandible much shorter than the left. An arthroplasty was performed at the Massachusetts Eye and Ear Infirmary on May 31, under ether anesthesia, in the usual manner herein described.

Following the operation the patient made an uneventful recovery, and she was able to open the jaws satisfactorily (Fig. 21).

The next step in the treatment of this patient was to improve the external appearance. The first operation toward this end was performed on May 29, 1931, under ether anesthesia administered rectally. It consisted of elongating the right side of the mandible. Previous to the operation, how-

ever, dental splints were made and cemented over the maxillary and mandibular teeth. The right mandibular third molar—under local anesthesia—was freely exposed for the purpose of utilizing it later on for the retention of the splint.

Incision was made over the right alveolar process beginning from the third molar down to the cuspid region of the mandible (the intervening teeth had been lost). The buccal side of the mandible was freely exposed, and with a surgical burr a diagonal cut was made through the mandible beginning from the third molar and extending gradually downward and forward to the symphysis. Holes were drilled through the end of each fragment, and the two parts were separated as far forward as possible and then wired together. External drainage was established through a buttonhole incision in the floor of the mouth. The patient made an uneventful recovery. There was considerable improvement in the prominence of the chin, but not enough to be satisfactory. A third operation was performed on September 12, in which an osteoperiosteal graft taken from the tibia was inserted in front of the symphysis through a small opening in the side of the face. This operation added further prominence to the chin (Fig. 22). As the patient had lost a good many teeth, her dental condition was improved by the construction of artificial dentures.

Case 9. Ankylosis from intraoral radiation scars. G. G., male, aged 60 years. Four years previously, this patient had been operated upon for squamous cell carcinoma of the mucosa of the left cheek. The left cheek had been irradiated and a block dissection of the neck glands on the left side had been performed at that time.

On examination there was found no evidence of recurrence of the carcinoma either locally or in the neck. The mandibular excursion was only 1 centimeter and the cause for this seemed to lie in a mass of intraoral scars, occupying most of the buccal mucosa. On account of the ankylosis and also because artificial dentures could not be used, the patient was quite desirous of relief.

In this case I did not feel that free transplantation of skin would be feasible because of dense radiation scars replacing the tissues of the cheek, and consequently decided on bringing up a flap of neck tissue. This was done in three stages. On May 17, 1928, a rectangular flap of skin, its base toward the mandible, was raised from its bed on the side of the left neck, 2.5 inches by 4 inches in diameter (Fig. 23). This was replaced to its original position by several sutures until the second operation on May 31, 1928. At this time an incision was made along the lower border of the mandible and the mouth was entered along the buccal aspect of the jaw. The intraoral scar tissue was now excised and it was found that the jaw opened freely. The delayed flap was now raised and drawn directly into the mouth (its outer surface thus becoming the inner surface inside the mouth). The original lower border of the flap was sutured to the upper border of the buccal wound and the two sides were sutured carefully into the borders of the wound (Fig. 24). On

June 21, 1928, the flap was cut through where it was folded back on itself (Fig. 25). There was present enough tissue to create a buccal fold in the mouth by suturing the cut edge to the alveolar process of the mandible. The neck wound was closed partly by the original pedicle and partly by under-

Fig. 20.—Photographs showing complete ankylosis of the jaw with marked underdevelopment of the mandible (Case 8).

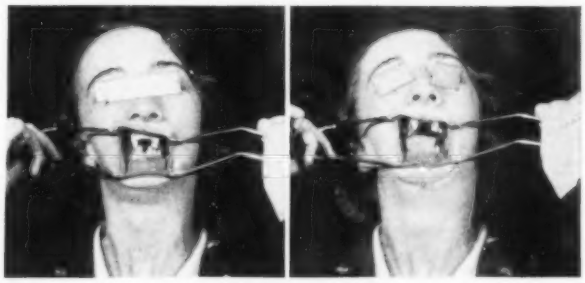

Fig. 21.—Postoperative photographs of patient (Case 8).

Fig. 22.—External deformity was corrected by (1) elongating the right side of mandible; (2) by transplantation of a suitable section of bone taken from tibia (Case 8).

mining the neighboring tissues. On October 5, 1928, a few superficial intra-oral webs were excised and the surrounding mucosa was ample to cover the area.

The patient at this time, and 2 months later, could open his mouth 4.5 centimeters. He was able to have artificial dentures made and could use them efficiently (Fig. 26).

Case 10. Ankylosis with mandibular retrusion; correction of ankylosis and repair of the deformity. M. S., female, aged 17 years. About 15 years ago the patient, at the age of 2, following an attack of pneumonia, developed an abscess

Fig. 23.

Fig. 24.

Fig. 23.—Diagram showing a delayed flap which was later transferred to the side of the mouth to replace the missing mucous membrane lining of the cheek (Case 9).

Fig. 24.—Photograph of patient showing the delayed flap already transferred to inside of cheek through an incision under the lower border of the mandible (Case 9).

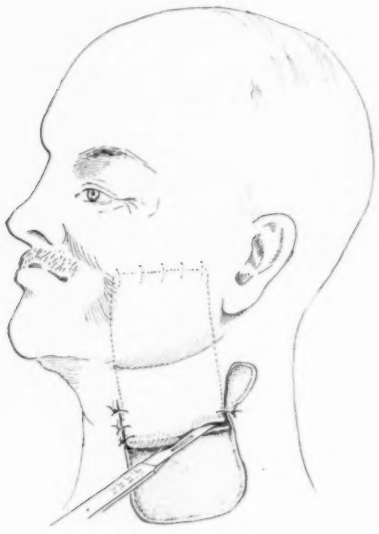

Fig. 25.

Fig. 26.

Fig. 25.—The lower end of the delayed flap was cut through and sutured to the buccal side of the lower alveolar process while the unused part was resutured to its original position (Case 9).

Fig. 26.—Photograph showing patient able to open the mouth wide enough to allow for use of full upper and lower dentures (Case 9).

at the angle of the left mandible. This was incised and drained. Immediately following this, the patient had difficulty in using her jaw. This condition became progressively worse so that food had to be pushed into her mouth. In

spite of this, however, she got along fairly well. Thirteen years ago an operation had been performed by forcing the jaw open and rubber mouth gag placed between the teeth in order to hold the jaw open. Ten years ago the jaw was opened forcibly and the patient's tonsils removed. In spite of early treatment the ankylosis became progressively worse and as she grew older the deformity of the lower part of the face became more and more pronounced.

The patient was seen at the Plastic Clinic of the Massachusetts General Hospital in January, 1935. Examination showed the patient to have complete

Fig. 27.—Pre-operative photographs (Case 10).

Fig. 28.—Postoperative photographs (Case 10).

bony ankylosis on the left side; also underdevelopment of the left side of the mandible resulting in deviation of the mandible to the left and recession of the chin (Fig. 27). The general physical condition of the patient was good. She was advised to have an operation for arthroplasty in order to re-establish the movement of the jaw, and also an operation for correction of the deformity.

On January 28, 1935, under general anesthesia, the usual operation for ankylosis was performed.

The patient made an uneventful recovery and she was able to use her jaws quite satisfactorily. Being thus satisfied that she had obtained the normal

motions of the movements of the jaw it was decided to operate and improve the deformity of the face. She was again admitted to the hospital on November 8, 1936. The operation was performed on November 9, under general anesthesia. The purpose of this operation was to elongate the left side of the mandible which would automatically bring the chin forward and give a better symmetry to the face. An incision was made over the crest of the alveolar ridge extending from the retromolar region down to the second bicuspid (the molar teeth were missing). The buccal side of the lower jaw was exposed freely and, with a surgical burr, the mandible was cut through in a diagonal manner as seen in the diagram. Holes were made through the extreme ends of the disconnected bone with a surgical burr. A brass wire, 19 gauge, was then passed through these holes and the ends of the wire twisted together. This allowed the left side of the mandible to slide forward for about 1 inch. The twisted ends of the wire were allowed to pierce through the mucous membrane of the buccal cavity. The incision wound of the mucous membrane was sutured and the upper and lower jaws were fastened together with elastics attached to dental splints which had been made at the Harvard University Dental School and cemented over the teeth previous to the operation.

The brass wires were removed 3 weeks following the operation, and the jaw consolidated satisfactorily. The improvement of the facial contour following this operation was very gratifying.

Remarks: In an operation of this type one is obliged to disturb the occlusion of the existing teeth more or less but in young patients judicial orthodontic treatment combined with various types of dental restorations have given satisfactory results (Fig. 28).

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TIC DOULOUREUX

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A WHITE female, 28 years of age, fairly well nourished, appeared at the clinic of the Lincoln Hospital in New York City. She was extremely hysterical and in her agony was demanding the removal of the maxillary right and mandibular canines. Other teeth on the right side of the mouth had already been removed on previous occasions when the pain impulses drove her to seek relief. Inasmuch as the teeth that the patient wanted out did not show lesions of even the slightest degree, they were not removed.

The symptoms as described by the patient were characterized by a "sharp, sticking, electric-like pain" on the right side involving both the mandible and the maxilla. When the pain struck, it seemed to localize directly in a tooth.

Pains began a year ago and recurred at wide intervals. As time went on, the lapses of relief grew shorter. At time of admission to the hospital, patient was having attacks every three minutes, lasting a second or slightly longer. Pain impulses started when patient swallowed or opened the mouth too wide, or drank cold liquids. The pain was more severe at night.

The systemic report showed a negative Wassermann, some cardiac insufficiency, and extreme hysteria bordering on fits of threatened suicide.

Diagnosis.—Tic douloureux (trigeminal neuralgia). The neuralgia apparently involved the second and third divisions of the fifth nerve.

Treatment.—After hospitalization, the patient was quieted with sedatives and given potassium iodide, ten grains, three times a day. Marked improvement followed this treatment. Complete cessation of pain impulses, however, was not obtained. Inhalations of trichlorethylene were then given, but only resulted in adding severe head pains to the patient's suffering.

At the time that it was decided to inject alcohol into the third division of the fifth nerve, much of the pain had been relieved by the potassium iodide. The hysteria had completely abated.

On the sixth day following admission, 3 c.c. of alcohol 70 per cent was injected after a mandibular block injection of novocain had first been administered. All pain disappeared promptly. Three days later a second injection of alcohol 95 per cent was administered without novocain as a preliminary step. This was done because the apparent dilution of the novocain and alcohol at the first injection had not completely relieved all pain symptoms. The second injection was followed by complete paresthesia and freedom from any pain whatsoever.

DISCUSSION

It is interesting to consider here the action of potassium iodide in giving considerable relief. This is a drug that enjoys some favor with many medical men and despite its unknown rationale, seems to help obscure neuralgias when other means fail.

*Dental Interne, Lincoln Hospital.

Case Reports

This month we have three cases of angioneurotic edema presented by Dr. Thomas J. Cook of the University of Pennsylvania.

Readers are invited to send interesting case histories to the editor, and also to discuss published cases. Send histories, photographs, and discussions, to Dr. Kurt H. Thoma, 47 Bay State Road, Boston, Mass.

CASE REPORTS NOS. 19 TO 21

Angioneurotic Edema

Thomas J. Cook,* D.D.S., Philadelphia, Pa.

The complaint of acute massive ephemeral swellings of the skin of the face and the mucous membranes of the oral cavity is encountered frequently enough that a consideration of the underlying cause and treatment is of interest and importance to the dental profession.

Angioneurotic edema commands the interest of investigators in dentistry because it belongs in the realm of the unknown. This disease has created a diversity of opinion regarding its etiology because it may or may not have familial characteristics or it may be allergic in nature.

Our attention was first directed to this condition when, not infrequently, such patients presented themselves to the Oral Diagnosis Clinic in an effort to obtain relief from the recurrent swellings. Some gave a history of having had aparently normal teeth removed with only temporary relief.

Angioneurotic edema was first described by Strubing[19] in 1885. Although the same syndrome was reported by Quincke[15] a few years earlier, Cassirer[1] reported over a hundred cases under the same title, that of acute circumscribed edema, in 1914.

In 1903 Crocker[4] wrote of angioneurotic edema as giant urticaria. Kohn[8] in 1901, Halsted[5] in 1905, Packard[14] in 1899, Osler[12] in 1895, Yarian[21] in 1896, Chittenden[2] in 1898, and Schlesinger[17] in 1899 pointed out the relationship existent in urticaria and angioneurotic edema.

Holmes[6] in 1899 reported acute local edema complicated by salivation and purpura, while Kussner[9] in 1889 reported hemorrhages of unknown cause from mucous membranes simultaneously with edema.

In 1919 Stokes[18] reported the relationship of erythema nodosum and tuberculosis, while in 1915 Rosenow[16] reported the relationship to nontuberculous infections.

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ETIOLOGY

Investigators have assigned numerous causes to angioneurotic edema, but there seems to be a consensus that there is a direct relationship to thermal changes, with particular emphasis on cold.

Fig. 1.—Edema of the upper lip in a patient with angioneurotic edema.

Fig. 2.—Same case as Fig. 1. The patient has been edentulous for several years. Roentgenograms of the maxilla were negative.

Wills and Cooper[20] reported cases bearing a direct relationship to cold, while Kohn[8] and Collins[3] reported cases that were directly or indirectly attributed to heat.

Anaphylaxis has been considered as an etiologic factor by Morse[11] and Halsted.[5] Osler[13] cited the relationship of certain foods while Miller and Pepper[10] found the chemical condition of the blood a factor.

Many other etiological factors such as nervous disorders, psychic disturbances, menstruation, trauma, and heredity have been considered by Joseph,[7] Cassirer,[1] and Halsted[5] each reporting cases to prove their belief.

Symptoms.—About the face the edema is usually large, developing rapidly after a short period of itching and sudsiding without any evidence of its existence. This edema may spread from the face to the mucosa of the pharynx. The mucous membrane becomes very edematous and extends into the deeper connective tissue and muscle.

CASE NO. 19

A man, aged 28 years, complained of "occasional swellings" about the face for a period of one year. He gave a history of having had one tooth removed six months earlier because of a swelling on the right side of the face, but he obtained only temporary relief. The patient reported that on several occasions when he drank excessive amounts of alcohol for several successive days after he finally stopped, his face became so bloated that the features were unrecognizable. The general physical examination, which included urinalysis, complete blood count, and renal functional tests, was negative. There was no evidence of dental sepsis.

CASE NO. 20

A man, aged 48, came to the Oral Diagnosis Clinic, complaining of a swollen upper lip (Fig. 1). He gave a history of several previous attacks, usually localized about the lips. These attacks began suddenly, lasted for three or four hours, and disappeared suddenly. Oral examination revealed that the patient was edentulous. Roentgenograms of the jaws were negative. General physical examination revealed a well-developed adult while the various tests offered no clue as to the etiology.

CASE NO. 21

A female, aged 21, a dental student, wrote of her symptoms and observations during several attacks:

"My first symptoms were those of edema of the soft palate. I had an uncomfortable feeling at the posterior border of the floor of the nose, somewhat similar to a patch of mucus which cannot be discharged. I noticed on examination a slight increase in redness of the mucous membrane covering the fauces. With me this particular lesion had always been unilateral, unlike others, which at most times have been bilateral and almost symmetrical. This uncomfortable feeling continued until I began to feel difficulty in breathing on that side as well as a slight annoyance and slight pain on swallowing. Examination of the oral cavity revealed a curtain of almost transparent mucoid material hanging from the apex of the uvula to the lateral wall of the fauces, filling half of the pharyngopalatine arch. I have never had the edema progress beyond this point. Within three to four hours after adrenalin injections, the edema was entirely absorbed.

"Both my upper and lower lips have been affected. I believe the edema is entirely of the mucous membrane as the lip had the tendency to roll outward

and impressions of the teeth were left in the mucous membrane where the swelling extended to the cheeks. I first felt a slight itching and increased heat which usually begins at one corner of the mouth and can be felt to progress over the lip to the other corner. While watching a game one evening, I felt the swelling begin, and before the game was over my lip enlarged to about the size of a sausage. I had to cover my face with a handkerchief. There was no real pain, but a slight numbness and a tingling sensation. The pressure was so great I felt the slightest motion would cause the lip to burst. Once the swelling had reached its height, the application of ice packs and adrenalin in about five hours reduced the condition. The mucous membrane was left greatly wrinkled and had the appearance of an old woman's face. Pain on pressure was characteristic of all lesions once the edema had subsided."

CONCLUSIONS

Patients having this disease may present themselves to a dentist for treatment with the feeling that the facial swelling is the result of oral infection. Since it is true that teeth have been removed for such patients with no apparent relief and since it has been reported that patients with this disease have died following the extraction of teeth,[4] the facts indicate the advisability of medical consultation on such cases.

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Department of Orthodontic Abstracts and Reviews

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Studies in Dental Prosthetics. By Prof. G. Y. Hildebrand, Laborator in Prosthetics and Orthodontia at the Dental Institute of the Royal Caroline Medico-Chirurgical Institute in Stockholm. Two Volumes. Stockholm, Sweden, 1937, The Swedish Dental Association.

The Editor of the *Svensk Tandläkare-Tidskrift* (Swedish Dental Journal) and of the staff of the Prosthetic and Orthodontic Department of the Dental Institute, Stockholm, "attempts to investigate the problems of dental prosthetics." Every problem regarding dental restorations, with the exception of the full denture and individual tooth restoration, is considered and evaluated.

These investigations were begun in 1922, from the author's private practice. Two years later he started the same careful study in his department at the Dental Institute, the restorative work being done by students. The re-examinations were begun in 1932 and were completed by 1934. The results of the investigations were completed by 1937. Of 265 cases examined when the studies were started, for reasons beyond the author's control only sixty cases could be completed.

A complete medical and oral examination was made when treatments were started and repeated when re-examinations were begun. The oral examination consisted of a thorough clinical examination, radiographs and models. In the oral clinical examination careful note was taken of (1) loss of teeth and reason for loss; (2) the condition of the mucous membrane; and (3) the occlusion and mandibulo-cranial relation. The alveolar crests and bone formation could best be studied from the radiographs. Models were taken before treatment was begun, at the time treatment was completed with the restorations in place and at the re-examination with the restorations in place.

The restorations are considered under three main types: Hang-prosthesis (tooth-bearing); Stress-prosthesis (tissue-bearing); Hang and Stress prosthesis (tooth and tissue bearing). The effects of these various types of restorations on the teeth and tissues are discussed in detail.

Dr. Hildebrand summarizes his clinical findings with the following conclusions. First, the H-prosthesis, by its splint action, is a promoter of bone formation; the S-prosthesis, by its load action, is a destroyer of bone. Second, the H-prosthesis, as a promoter of bone formation, conserves abutment teeth against loosening, while the S-prosthesis favors loosening. Third, the prevalence

of decay is greater with the S-prosthesis than with the H-prosthesis. Fourth, the problem of oral hygiene is found to be worse in cases of S-prosthesis than in cases of H-prosthesis. Fifth, the S-prosthesis must be deemed a serious promoter of infection in the basal tissues; the H-prosthesis where it is adapted to vital teeth is rather harmless. From the author's scientific reasoning and detailed quotations, the reader cannot help but agree that tooth-bearing restorations are less harmful to the teeth and surrounding tissues than the tissue-bearing types.

There are chapters entitled "Relation of the Teeth and Mastication to Resorption of Food"; "Stress of Mastication"; "The Action of the Prosthesis on the Pulp"; "The Significance of Dental Focal Infection From a Prosthetic Standpoint."

Of great interest to the reader will be the novel method used by Prof. Hildebrand in publishing his two volumes. Volume I consists of the text. Volume II contains the radiographs and illustrations. Should the reader desire to read the history of a particular case and observe the illustrations of the same case at the same time, it can be done without the annoyance of turning pages of the text to look back at the illustrations. Besides the text, Volume I contains a bibliography and eleven tables. The two volumes are paper covered. The printing is clear, but unfortunately many words are misspelled. The illustrations are excellent. The drawings of various types of preparations and abutments show able craftsmanship. These studies are the work of a scholar and scientist.

S. Trieff.

Editorial

Orthodontic Paradox

A pediatrician addressing a group for Parent Education advised his audience that thumb-sucking should be ignored in children; on the other hand, an orthodontist addressing the American Dental Association meeting in St. Louis during October urged parents to break the thumb-sucking habit in their children, saying it might cause serious deformities in the mouth which must be corrected later in the child's life.

According to a newspaper report, a well-known sculptress appearing as an essayist at the same dental convention, declared that most orthodontists plan the way a mouth should appear after correction without reference to the face *as a whole* with its distinctive national, family, and personal characteristics.

The essayist is quoted as having affirmed that "a round, full dental arch may be radiantly successful on a young Siegfried or a young Brunhilde, but it is out of place on a long-faced Spaniard or a thin-faced Englishman," and she is said to have admonished orthodontists "to take every precaution that the work does not negate the expression nature intended" and that "if the teeth are too large, it is better to take out a few rather than ruin a sensitive type of face by giving it a round arch that does not belong there." (This latter advice is contrary to the general orthodox orthodontic concept based on normal occlusion.)

"Take the case of little Mary, for example. She has a delicate, narrow face, with a slightly recessive chin, but the parts are harmonious and indescribably pleasing. Her parents cannot bear the imperfection of crooked teeth so the dentist makes a gleaming straight row with perfect contact of the jaws. Mary's peculiar delightfulness and charm are gone. She could be one of a hundred girls."

To go back to the pediatrician. He obviously is well posted on dieties, nutrition, and children's diseases; however, when he advises parents that thumb-sucking in children should be ignored, this is plainly based on casual clinical observation and personal opinion which means little when offset by the careful scientific work and hundreds of case deductions which have been reported upon this subject by Lewis and others who have made a long series of studies of deformities of the mouth as a result of thumb-sucking in children.

The opinion of the sculptress is no doubt seriously regarded in artistic circles. However, the quotations above, quoted by the press from her talk at the American Dental Association convention, have little application to the orthodontic problem for several reasons. The principal reason is that the orthodontist is unable, even if he so desired, to drape and design the position of teeth, like a piece of tapestry or as a sculptor molds a piece of clay, and make them remain that way. Regardless of where an orthodontist may place the teeth, so to speak,

in the end they remain only in a position in which the combined forces of occlusion, heredity, and the biological urge of growth and development dictate. To place the teeth here and there, according to eye guidance, much as a painter does a landscape or a sculptor molds plastics, all orthodontists know, can no more be accomplished than can a twig be bent and made to stay exactly where it is bent, nor can the English bulldog's mandible be moved backward and made to stay that way in violation of his normal, anatomical pattern. They know that teeth will remain, finally, only in the positions determined by the combined forces of occlusion, heredity, and growth patterns and that much of this pattern was predestined in the union of the original chromosomes of the species.

Individual opinions and expressions based on personal observation are ordinarily interesting; but, when these opinions find their way into the press with wide public circulation, these opinions become important because they place the orthodontist in the position of the daily discussion and defense of facts that have long ago been proved beyond doubt. The constructive moral lesson to be derived is, no doubt, that orthodontic programs when reported to newspapers should always be censored because even the most orthodox concept is too often distorted in its intent and meaning when translated into the pabulum for newspaper consumption. The orthodontist understands exactly what the sculptress means when she refers to the harmonious relationship that exists between the teeth and face, but newspaper interpretation is too literal and, incidentally, creates exactly the opposite impression in the public mind as to what was intended by the essayist.

The pediatrician means well in giving advice to parents in regard to thumb-sucking; however his mistake is that he has not kept up on his thumb-sucking research, and the advice is too inaccurate for general lay consumption.

H. C. P.

In Memoriam

Frank A. Gough

Dr. Frank A. Gough, of Brooklyn, N. Y., another of the orthodontic pioneers, died on Aug. 15, 1938, at the place of his birth in northeast Pennsylvania.

Dr. Gough graduated from the University of Buffalo in 1895 and from the New York Dental School in 1896. After practicing for a short time in Pennsylvania, he established an office in Brooklyn in 1902, becoming the fourth dentist to secure a license in New York State after the enactment of the licensing law. He received a certificate from the Angle School of Orthodontia in 1900, attending the first class conducted by Dr. Angle in St. Louis, Mo. In 1906 he limited his practice to the specialty of orthodontics.

He was a member of various dental organizations and among many of his numerous activities he served as president of the Second District Dental Society, as member of the Council of the Dental Society of the State of New York and repeatedly as delegate to the American Dental Association. A serious illness recently forced him to sever his last official tie with the profession, at which time he was secretary of the Second District Dental Society.

For the last few years, one of Dr. Gough's principal activities has been serving as editor, and later as business manager of the *Angle Orthodontist,* and he assisted greatly in creating that quarterly which was published in the interest of the specialty of orthodontics. Dr. Gough was a man of much native talent which won for him the respect of not only his professional confreres, but many laymen as well. He served crippled children through a recreation camp; he served masonic lodges and numerous other organizations with a philanthropic motive.

The memory of Dr. Frank Gough reflects another of those intrepid souls who helped to create the modern specialty of orthodontics—a man whose loyalty and fidelity to an ideal was an inspiration to many—a man whose devotion to his specialty was like that of a great maestro to his music.

The orthodontic fraternity will remember Dr. Gough with great reverence and respect because of his fine record in orthodontics over a long period of years.

News and Notes

Examination for Appointment in the Dental Corps, Regular Army

An examination for the selection of candidates for appointment in the Dental Corps, Regular Army, will be held during the period Feb. 13-18, 1939.

The examination, which will include both physical and professional examinations, the latter consisting of written, oral and clinical tests, is open to male citizens of the United States between the ages of 22 $\frac{9}{12}$ and 31 $\frac{9}{12}$ years at the time of the examination who are graduates of acceptable dental schools and who have had at least 1 $\frac{11}{12}$ years' subsequent practice in their profession.

Full information and application blanks will be furnished upon request to the Adjutant General, War Department, Washington, D. C. Applications will not be considered after Jan. 31, 1939.

Massachusetts Dental Society

The seventy-fifth annual meeting of the Massachusetts Dental Society will be held at the Hotel Statler in Boston, Mass., April 24-27, 1939. The subject of the meeting will be the "Trend of Dentistry During the Last Seventy-five Years." There will be outstanding speakers from all over the country, a health exhibit, and a clinical program.

Dr. Frank W. Rounds, President,
270 Commonwealth Avenue,
Boston, Mass.

Midwinter Dental Clinic

Every ethical dentist of the Southwest who is a member of the Texas State Dental Society or the American Dental Association is cordially invited to attend the Twelfth Annual Meeting of the Midwinter Dental Clinic, sponsored by the Dallas County Dental Society, Monday, Tuesday, and Wednesday, Jan. 30 and 31 and Feb. 1, 1939, at the Hotel Adolphus, Dallas, Texas. At this clinic, outstanding nationally known clinicians will be presented in a three-day course of lectures and practical demonstration. The names of these clinicians will be announced in the next issue of the Journal.

The fee for this course is $15 which includes a ticket to the banquet, Tuesday, January 31. At this banquet, table clinics will be presented by members of the Dallas County Dental Society.

Dr. Thos. A. Lipscomb
Medical Arts Building
Dallas, Texas

Great Lakes Association of Orthodontists

The twelfth annual meeting of the Great Lakes Association of Orthodontists was held at the Hotel Statler, Cleveland, Ohio, Nov. 7 and 8, 1938. Papers and clinics were given by the following: Thomas J. McDermott, president Cleveland Dental Society; Ira A. Lehman, Detroit, Mich.; Harvey G. Bean, Toronto, Ont.; Richard E. Barnes, Cleveland; Charles J. Vosmik, president, Cleveland; Oren A. Oliver, Nashville, Tenn.; Varney E. Barnes, Cleveland; George S. Harris, Ann Arbor, Mich.; G. Vernon Fisk, Toronto, Ont.; Donald S. Sterrett, Erie, Pa.; Earl H. Teetzel, Detroit, Mich.; W. R. Flint, Pittsburgh, Pa.; Barnett Malbin, Detroit, Mich.; Allan C. Brodie, Chicago, Ill.; C. Edward Martinek, Detroit, Mich.; Frank S. Cartwright, Detroit, Mich.; and Irwin Steuer, Cleveland.

The Northern Section of the Pacific Coast Society of Orthodontists

The last regular meeting of the Northern Section of the Pacific Coast Society of Orthodontists was held at the College Club, Seattle, Wash., June 13, 1938. Case reports and clinics were given by Ed. Bishop, George Barker, E. J. Fraser, and Paul Lewis.

Chicago Dental Society

The 1939 Midwinter Meeting of the Chicago Dental Society will be held February 13-16 inclusive at the Stevens Hotel. The meeting will once again return to its four-day length after an experiment with a five-day session last year. In 1938 the Midwinter Meeting achieved new records in attendance, with more than ten thousand visitors being registered during the five days. Greatly enlarged commercial and scientific exhibits were also features which will be continued for the 1939 meeting.

Xi Psi Phi, Golden Anniversary

The golden anniversary celebration of the founding of Xi Psi Phi will be held at Ann Arbor, Mich., Feb. 8 and 9, 1939. An elaborate program has been arranged which includes the unveiling of a memorial on the campus of the University of Michigan, in commemoration of the founding. The founders will be guests of honor. All Xi Psi Phi's are urged to attend.

J. Floyd Alcorn, General Secretary,
3720 Washington Blvd.
St. Louis, Mo.

Central Section of the Pacific Coast Society of Orthodontists

The Central Section of the Pacific Coast Society of Orthodontists met at the Plaza Hotel, San Francisco, Calif., June 14, 1938. Dr. Harold Noyes of Chicago, Ill., spoke.

The Southern Section of the Pacific Coast Society of Orthodontists

A meeting of the Southern Section of the Pacific Coast Society of Orthodontists was held at the University Club, Los Angeles, Calif., June 10, 1938. Dr. Albert E. Voss, I. Eugene Gould, and George Turner were speakers.

Notes of Interest

Dr. Abram Hoffman announces the removal of his offices to Suite 205 North Shore Building, Highland Park, Ill., and presents Dr. Robert E. Gaylord, an associate.

Dr. George H. Herbert and associates, Drs. Leo B. Lundergan, Earl C. Bean, and Earl E. Shepard, announce the removal of their offices to 7002 Pershing Avenue, St. Louis, Mo. Practice limited to orthodontics.

Albert W. Crosby, D.D.S., announces the association of Wilbur D. Johnston, D.D.S., M.D., in the practice of orthodontics at 215 Whitney Avenue, New Haven, Conn.

W. W. Woodbury, D.D.S., Halifax, Nova Scotia, orthodontist and dean of the faculty of Dentistry, Dalhousie University, is president-elect of the Canadian Dental Association.

Dr. William Dwight Curtis announces the opening of his dental office for the exclusive practice of orthodontics, 1726 Eye Street, N. W., Washington, D. C.

Dr. John M. Marré announces the removal of his office to the Ladue Building at 33 North Meramec Avenue in Clayton, Mo., where he will limit his practice to exodontia and oral surgery.

Dr. Frederick W. Black announces the removal of his office to Suite 832, Doctors' Building, Cincinnati, Ohio.

William W. Martin, D.D.S., formerly associated with the Department of Orthodontics at Northwestern University, announces the removal of his office from Evanston, Ill., to 911a Broadway, Columbia, Mo. Practice limited to orthodontics.

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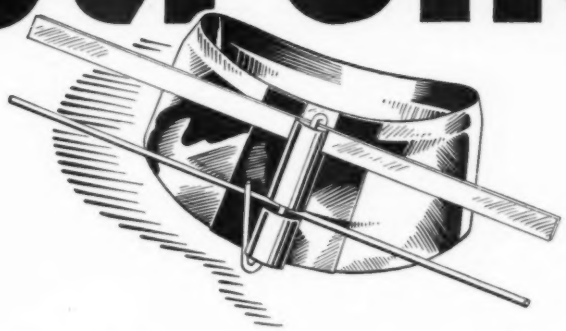

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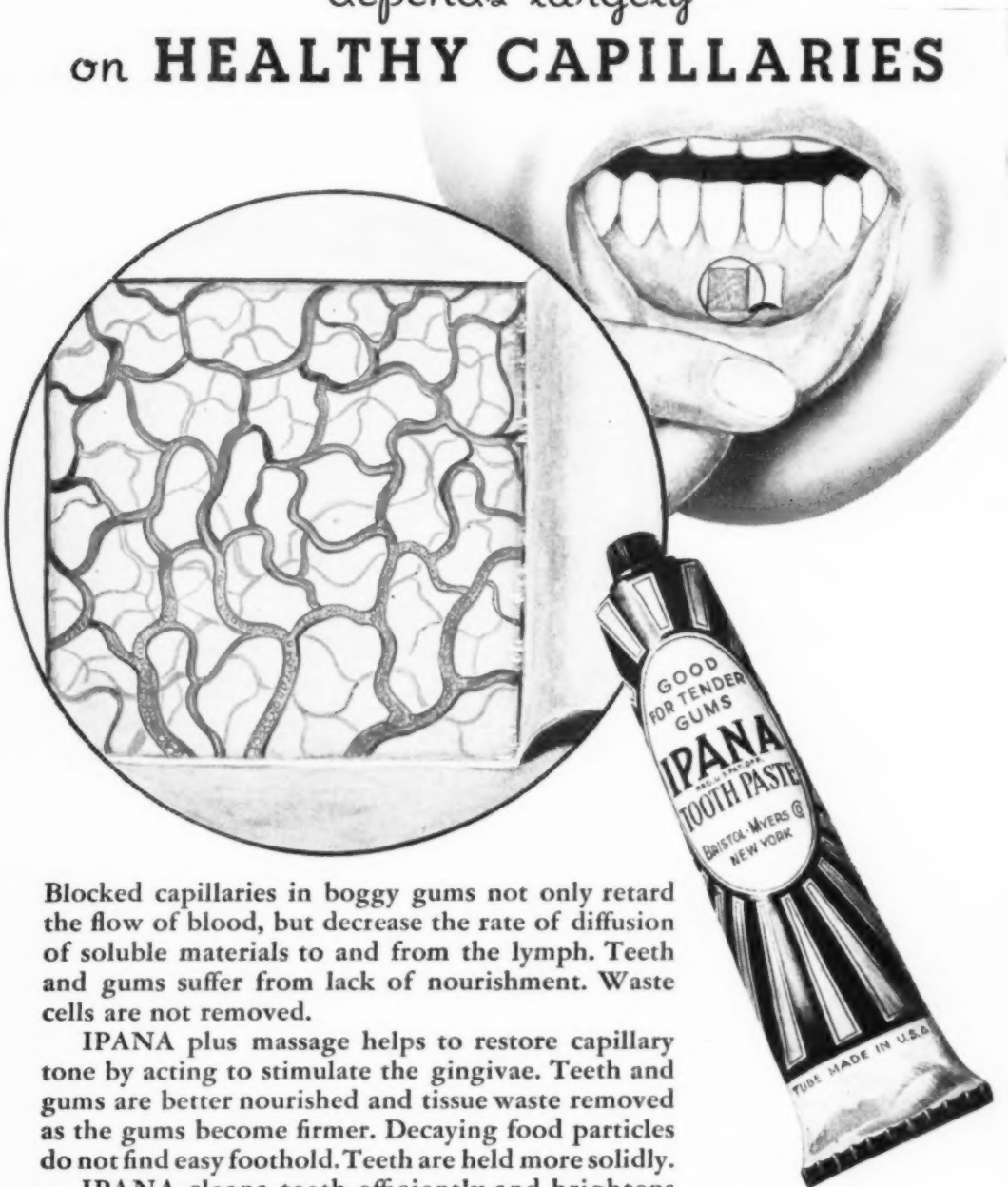

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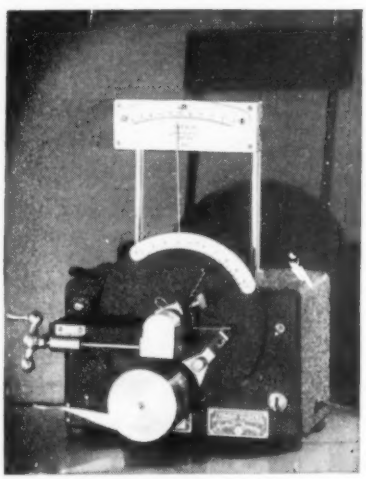

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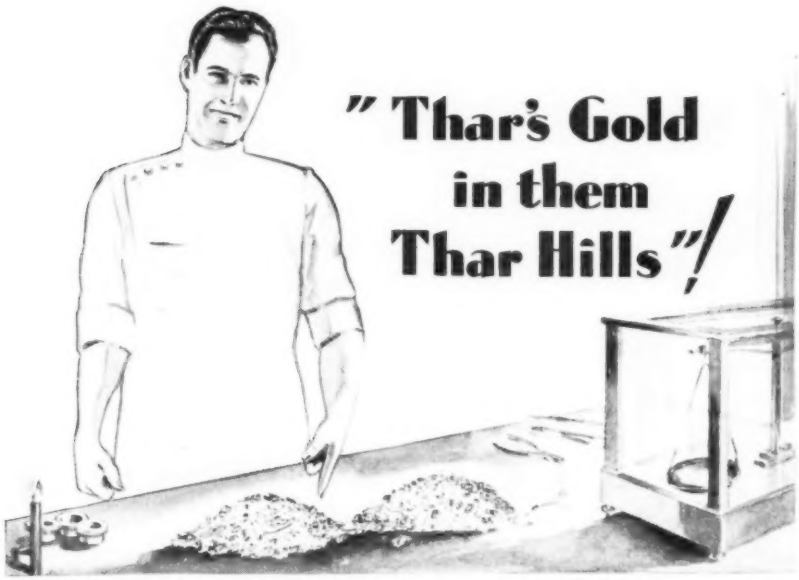

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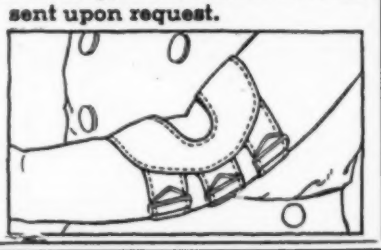

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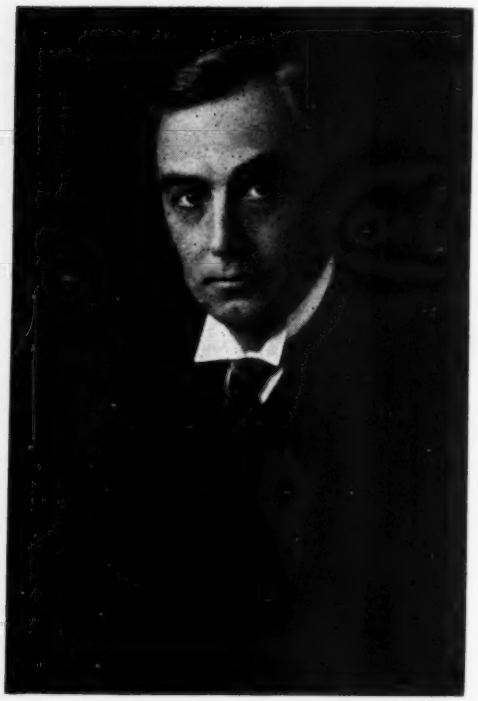

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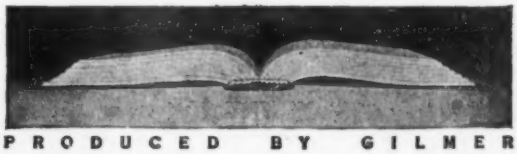

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